NITED STATES ARMED FORCES

Medical Journal

REFERENCE COPY

VOLUME II

July 1951

NUMBER 7

VOL. II JULY 1951 NO. 7

UNITED STATES ARMED FORCES MEDICAL JOURNAL

Published Monthly by the Armed Forces Medical Publication Agency, Department of Defense

WAYNE G. BRANDSTADT, *Colonel, MC, U. S. A., Editor-in-Chief*
ROBERT J. BENFORD, *Colonel, U. S. A. F. (MC), Associate Editor*
HAROLD A. LYONS, *Commander, MC, U. S. N., Associate Editor*

THE PRINTING OF THIS PUBLICATION HAS BEEN APPROVED BY THE DIRECTOR OF THE BUREAU OF THE BUDGET, OCT. 19, 1949

UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON : 1951

For sale by the Superintendent of Documents, U. S. Government Printing Office
Washington 25, D. C.

PROPERTY OF U. S.

Foreword

The UNITED STATES ARMED FORCES MEDICAL JOURNAL represents the unification of the BULLETIN OF THE UNITED STATES ARMY MEDICAL DEPARTMENT and the UNITED STATES NAVAL MEDICAL BULLETIN. This joint periodical is the medium for disseminating information of administrative and professional interest to all medical personnel of the Department of Defense.

The Chairman of the Armed Forces Medical Policy Council and the Surgeons General of the several services invite all medical officers, dental officers, Medical Service Corps officers, Nurse Corps officers, and officers of the Veterinary Corps of the Armed Forces, and the medical consultants of the Army, Navy, and Air Force to submit manuscripts for publication in this JOURNAL.

W. RANDOLPH LOVELACE, II, M. D.,
Chairman, Armed Forces Medical Policy Council, Department of Defense.

GEORGE E. ARMSTRONG
Major General, U. S. A., Surgeon General, U. S. Army.

LAMONT PUGH,
Rear Admiral, MC, U. S. N., Surgeon General, U. S. Navy.

HARRY G. ARMSTRONG,
Major General, U. S. A. F., Surgeon General, U. S. Air Force.

NOTICE TO CONTRIBUTORS

Contributions to the MEDICAL JOURNAL should be typewritten, double-spaced with wide margins on plain paper of standard letter size. Nothing should be written in the manuscript that is not intended for publication.

The MEDICAL JOURNAL endeavors to follow a uniform style in headings, captions, spelling, abbreviations, capitalizations, and the use of figures as set forth in the Government Printing Office Style Manual.

All illustrations should be unmounted. Pictures, prints, or drawings may be fastened on a sheet of paper by means of angular slits for each corner of the illustration; suitable identification can then be made on this sheet. Do not cut out portions of an illustration for reproduction. Photographs should be black and white glossy prints, preferably 4 by 5 or 8 by 10 inches to allow for reduction. Do not make any marks on the face or back of the photographs or drawings. Cellophane tape, staples, paper clips, or pins should not be used on illustrations. All charts and graphs must be drawn with black india ink on white paper; graph lines must not be in green or blue ink.

Contributions are to be the original work of the author. Quotations must be accurately and carefully copied and full credit must be given to the source. References, tables (charts), and legends must be double-spaced and on separate sheets. References should be listed according to the Quarterly Cumulative Index Medicus, A. M. A., and the sequence should be as follows: name of the author and initials; title of article; name of periodical; volume number; pages; and month and year. *Example:* Hinton, D., and Steiner, C. A.: Recurrent volvulus of sigmoid colon; unusual case report. Ann. Surg. 116: 147–149, July 1942. Authors are responsible for the accuracy of the bibliographic references.

The summary should be a factual and brief recapitulation of the observations or statements contained in the article. The conclusions drawn from the case, experiment, or facts set forth should be clearly stated and should appear at the close.

The editor is not responsible for the safe return of manuscripts and illustrations. All material supplied for illustration, if not original, must be accompanied by reference to the source and a statement that reproduction has been authorized. Recognizable photographs of patients should carry permission to publish.

All original contributions are accepted on the assumption that they have not appeared previously and are not to be reprinted elsewhere without the permission of the Editor, UNITED STATES ARMED FORCES MEDICAL JOURNAL, and that editorial privilege is granted to the UNITED STATES ARMED FORCES MEDICAL JOURNAL in preparing all material submitted for publication. Authors are urged to keep their articles short.

Address: U. S. Armed Forces Medical Journal, Bureau of Medicine and Surgery, Department of the Navy, Washington 25, D. C.

WAYNE G. BRANDSTADT, *Editor-in-Chief,*
Colonel, Medical Corps,
United States Army.

ROBERT J. BENFORD, *Associate Editor,*
Colonel, Medical Corps,
United States Air Force.

HAROLD A. LYONS, *Associate Editor,*
Commander, Medical Corps,
United States Navy.

The opinions expressed in this publication are not necessarily those of the Department of the Army, Department of the Navy, Department of the Air Force, or Department of Defense. References to regulations, orders, circular letters, or directives are for information only and do not, by publication herein, constitute authority for action.

Any reference in an article of this publication to a proprietary drug or its chemical formula shall not constitute an endorsement of its efficacy or use in the treatment of any disease.

SUBSCRIPTION PRICE OF THE JOURNAL

Subscriptions should be sent to the Superintendent of Documents, United States Government Printing Office, Washington 25, D. C.

Yearly subscription, $4; foreign subscription, $5.35.

Single number, 35 cents.

Exchange of publications will be extended to medical and scientific organizations, societies, and journals. Communications on this subject should be addressed to the Editor, UNITED STATES ARMED FORCES MEDICAL JOURNAL, Potomac Annex, Department of the Navy, Washington 25, D. C.

REPRINTS

The Superintendent of Documents will furnish, on request, prices for reprints of 100 or more copies of articles contained in the UNITED STATES ARMED FORCES MEDICAL JOURNAL. Orders for reprints must be placed within 2 months after date of publication.

For prompt attention, requests must be addressed as follows: Superintendent of Documents, Attention: Procurement Section, Government Printing Office, Washington 25, D. C.

THE JOURNAL IS INDEXED IN THE FOLLOWING PUBLICATIONS:

Current List of Medical Literature
(Army Medical Library) Monthly listing of journal contents; subject and author index monthly; cumulative index annually.

Quarterly Cumulative Index Medicus
(American Medical Association) Author and subject.

Table of Contents

	Page
Acute Head Injury—*Joseph P. Evans, Henry W. Ryder, F. Vatnar Kristoff, Frank F. Espey,* and *Fariss D. Kimbell, Jr.*	1001
Hematology, Diagnosis, and Therapy of Radiation Injury—*Eugene P. Cronkite*	1019
Basic Airborne Training—*Douglas Lindsey* and *Thomas G. Nelson*	1027
Atelectasis Following Removal of Impacted Tooth—*James L. E. Bock* and *I. Louis Hoffman*	1039
Focal Attack in Tuberculosis Control—*Sidney A. Britten* and *Wilbur V. Charter*	1045
Repair of Antro-Oral Fistula: Report of Case—*Richard J. Burch*	1055
The Treatment of Urinary Tract Infection—*James C. Kimbrough*	1061
Injection of the Lumbar Intervertebral Disks: A Diagnostic Method—*Thomas I. Hoen, William H. Druckemiller,* and *Albert W. Cook*	1067
The Surgical Treatment of Inguinal Hernia in Infants and Children—*Ogden C. Bruton* and *Sam F. Seeley*	1075
Articles by Personnel of the Medical Services of the Armed Forces Published in Other Journals	1078
Orbital Decompression, Transmaxillary Approach: Report of a Case—*Adrian J. Delaney* and *Samuel H. Oliver*	1079
Eosinophilic Granuloma of the Lung: Report of Two Cases—*Charles J. Farinacci, Hugh C. Jeffrey,* and *Robert W. Lackey*	1085
The Talus in Congenital Equinovarus Clubfoot—*Thomas M. Foley, Jr.*	1095
Armed Services Medical Regulating Office—*Byron L. Steger* and *Donald E. Domina*	1101
About the Army Medical Service: The New Army Interns and Residents—*Charles H. Gingles*	1105
BOOKS RECEIVED	1113
BOOK REVIEWS	1117

OFFICE OF THE SECRETARY OF DEFENSE
ARMED FORCES MEDICAL POLICY COUNCIL
WASHINGTON 25, D.C.

MEMO: Personnel of the Medical Services of the United States Armed Forces

It is a real pleasure to have an opportunity to work with and for all the personnel of the Medical Services on a continuing program of the Department of Defense to serve with highest effectiveness the soldiers, sailors, marines, and airmen in the combat forces.

Field medicine must be restored to the same high level of professional recognition and accomplishment as our definitive and specialist program. The Armed Forces Medical Policy Council will gear all programs of integration and coordination of the military medical services, including an adequate, able reserve program to support the combat forces.

W. Randolph Lovelace, II

W. Randolph Lovelace, II, M. D.
Chairman

UNITED STATES ARMED FORCES
MEDICAL JOURNAL

Volume II July 1951 Number 7

Acute Head Injury (1, 2)

Joseph P. Evans, M. D. (3)
Henry W. Ryder, M. D. (3)
F. Vatnar Kristoff, M. D. (3)
Frank F. Espey, M. D. (3)
Fariss D. Kimbell, Jr., M. D. (3)

THE HEAD wounds of warfare do not differ in essentials from those of civil life but they do differ in severity and in concentration of cases of particular character. With the mechanization of modern warfare many of the typical injuries of civil life in our motorized age are carried over into military life. Penetrating wounds and particularly those associated with the carrying in of foreign bodies form a much higher proportion of cases for the military than for the civilian surgeon.

We believe that it is a useful analytic technic to consider injuries to the head under four general categories, each dealing with a major form of trauma. Any patient may present injuries falling into one or more of these categories. Such divisions are useful only if they facilitate thinking and if they are accompanied by a clear-cut synthesis which permits the wrapping of the problem, as it were, into one package. The surgeon must constantly bear in mind the influence of injuries to other parts of the body; thus primary shock, fat embolism, the influence of respiratory obstruction in complicating nervous system injury, are all matters of vital significance, but all of our thinking in relation to head injury ought properly to be based on clearly conceived physiologic concepts brought realistically to bear on the clinical problem at hand. The four categories are: scalp injury, fractures of the skull, meningeal hemorrhage, and brain injury proper. For the sake of completeness only, we shall make brief allusion to the first two groups.

---

(1) Based on a paper read by Dr. Evans at the Monthly Medical Meeting, Army Medical Center, Washington, D. C., 15 February 1951.

(2) The investigative work reported has been carried out under terms of a contract with the Surgeon General's Office, Department of the Army.

(3) Division of Neurosurgery, Department of Surgery, College of Medicine, University of Cincinnati, Cincinnati, Ohio.

SCALP INJURIES

Injuries to the scalp are of importance primarily because they may expose the inner structures to infection, because they may be the source of serious bleeding, or because they may involve serious cosmetic sequelas. Even simple scalp wounds deserve careful surgical attention for a simple injury badly handled may lead to most serious sequelas. As an example, the following case may be cited.

CASE REPORT

Case 1.—A 2-year-old boy was struck in the left frontal region by a swing. The skin was apparently only bruised but in the next week the contused area became infected and was apparently incised inadequately. Subsequently he developed osteomyelitis and a left frontal lobe abscess. Removal of the osteomyelitic bone became necessary and the abscess was drained. An obliterative leptomeningitis developed about the base, hydrocephalus ensued, and it became necessary to perform a third ventriculostomy to permit the by-passing of fluid about the site of obstruction.

About a year and a half following this succession of events, tantalum cranioplasty was performed and for a time thereafter life was uneventful for him. Subsequently, he developed convulsive seizures of both the grand mal and psychomotor type. These attacks proved resistant to medical treatment and special schooling became necessary because of them. The psychomotor seizures were accompanied by a rage reaction and despite valiant psychotherapeutic efforts his conduct deteriorated and the boy was committed to institutional care by the probate court. Eventually the left frontal lobe, the site of the original abscess, was resected following which he improved but still required supervision. When he was 12 years old another child in the institution struck him. The wound broke down over the tantalum plate, and the plate had to be removed.

Comment.—The discomfort of the child, the disruption of the life of his family, the countless hours of professional care, and the economic waste to the community are elements difficult to evaluate. The case is cited to emphasize the seriousness of scalp injuries.

SKULL FRACTURE

The importance of skull fractures has been over-emphasized. There is a popular misconception in the lay mind, particularly in that of the lawyer, that skull fracture is necessarily accompanied by grave consequences. Table 1 gives a simple classification of skull fractures and points out the circumstances under which fractures become of importance. For the military surgeon, penetrating wounds which break the continuity of scalp and skull, which introduce foreign bodies and infection, or which create havoc by virtue of the velocity and the mass of the invading missile, are of the greatest importance but may be interpreted in terms of general principles. The nature of the skull fracture

serves in a rough way as an index of the severity of the injury. One must guard against infection which may result from compounding of the wound, either to the exterior over the convexity, or to the hidden cavities of the head (the nasal sinuses or the middle ear structures). One must beware of extradural clot, precipitated by fracture rupturing one of the major meningeal vessels, and one must recognize that a brain wounded by a depression may demand, because of potential swelling, more room than the compromised brain case can offer.

TABLE 1.—*Classification of skull fractures*

A. Closed:
   1. Simple linear fracture.
   2. Simple comminuted (egg-shell) fracture.
   3. Complicated linear or comminuted fracture.
      a. Across the middle meningeal artery.
      b. Across the major venous sinuses, such as the median longitudinal sinus.
      c. Across major neural structures, such as the olfactory nerve.
      d. Depressed.

B. Compound fractures:
   1. Simple.
   2. Comminuted
   3. Depressed.
   4. Through the accessory nasal sinuses or the petrous bone.

MENINGEAL HEMORRHAGE

The subarachnoid spaces are surgically inaccessible because of their narrowness and their trabeculated configuration, but another, and more important reason why subarachnoid hemorrhage does not, of itself, constitute a surgical entity is that the spaces are lined with reticulo-endothelial cells which because of their phagocytic capacity are far better able to clear the spaces of red blood cells than is the most active surgeon (*4*).

From the practical point of view epidural and subdural clots are much more important than subarachnoid hemorrhage. Such accumulations may occur on either side of the dura. Bleeding which occurs in the epidural space is almost always of arterial origin and is derived from one of the major meningeal vessels. Therefore it almost always accumulates rapidly. Bleeding into the epidural space sometimes appears to occur from external tears of one of the major venous sinuses (*5*). Most epidural clots accumulate in the temporoparietal region. Occasionally aberrant hemorrhage may be found over a frontal or occipital lobe and, rarely, over the cerebellum. The blood in escaping from its vessel, dissects

(*4*) Sprong, W.: Disappearance of blood from cerebrospinal fluid in traumatic subarachnoid haemorrhage; ineffectiveness of repeated lumbar punctures. Surg., Gynec. & Obst. 58: 705-710, Apr. 1934.

(*5*) Munro, D., and Maltby, G. L.: Extradural hemorrhage; study of 44 cases. Ann. Surg. 113: 192-203, Feb. 1941.

the dura from the undersurface of the skull and acts as a rapidly accumulating space-consuming lesion with dire consequences to the underlying brain.

Accumulation of blood in the subdural space is derived from one of two sources or a combination of the two. The major cortical veins in traversing the subdural space from the surface of the brain to the dural sinuses are practically devoid of support. Their points of entry into the venous sinuses are fixed whereas the brain itself is free to move within the brain case. Therefore in a head suddenly arrested in motion, the superior longitudinal sinus with its attached entering veins is also arrested. The brain, however, is free to move in a rotary direction so that the thin-walled bridging veins may be stretched unduly and if torn may give rise to rapid accumulation of clots.

The second source of bleeding into the subdural space is cortical contusion with tearing of the leptomeninges and the cortical vessels. We have exposed such torn vessels at operation.

We believe that it is often impossible to differentiate between an epidural and a subdural clot. The clinical findings in the two conditions are very little different, except that, in general, the epidural clots tend to accumulate more rapidly than their counterparts on the inner side of the dura. It is a mistake to attempt to delineate a classical picture of meningeal clot. We believe it better to attempt to visualize the clinical findings in terms of the functional disturbance that develops as the clot accumulates. Consciousness may have been lost at the time of injury. If not, it becomes obtunded and as bleeding progresses may be lost progressively. Compression of the underlying motor cortex produces a contralateral paresis which progresses to hemiplegia. The space-consuming clot shifts the underlying brain and the brain stem to the opposite side and stretches the third nerve on the side of the clot so that it may be thrown out of function and a dilated pupil may develop on the same side (fig. 1). Further shift of the brain results in compression of the venous outflow from the midbrain region, the thin-walled veins being obliterated by the advancing uncus, pushing against the midbrain itself. Apparently as a result of this compression venous back pressure hemorrhages occur in the midbrain at the level of the third nerve nuclei, and because they may occur in varying degree on either side of the midline they provide a second source of pupillary irregularity and explain the fact that meningeal clots are not always found on the side of the dilated pupil.

Similar lesions at this level are the cause of clinical decerebrate rigidity, the lesion producing an accurate analogue of experimental decerebration.

It is then clear that the differentiation between an epidural and a subdural hematoma is largely an academic exercise. In both instances, the mechanical problem is similar and the surgical implications are comparable. In the presence of such a clot, prompt action is imperative and

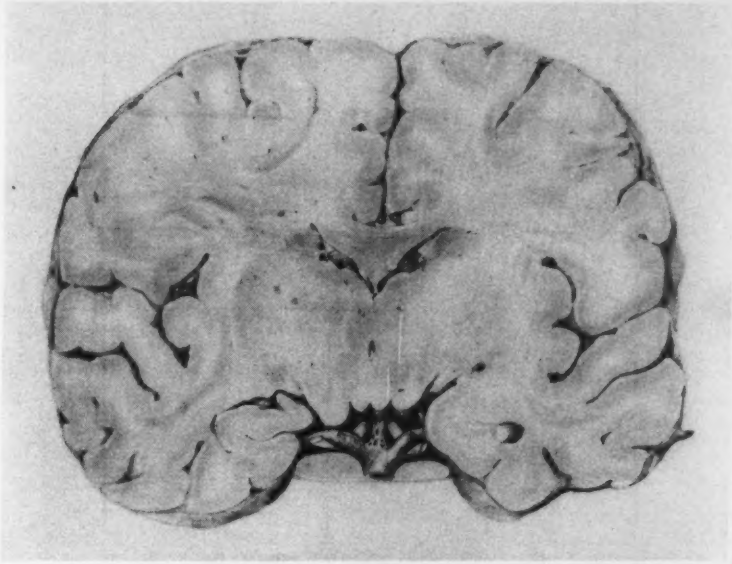


Figure 1.—Cut brain surface viewed from the front showing herniation of the right cerebral peduncle and the right uncus. Accentuation of this process, particularly when associated with displacement of the midbrain structures, stretches the third nerve as it courses about the posterior cerebral artery, and compromises nerve function, producing the Reid-Cone syndrome.

this consists of an exposure of the subtemporal region (facilitated by the head rest shown in figure 2) which gives one ready access to the middle meningeal artery and gives one free access to the subdural space if one must search for another source of hemorrhage. All bleeding points derived from branches of the middle meningeal artery must be coagulated to prevent further bleeding. On the other hand, in most instances when bleeding has occurred into the subdural space, the tamponade effect of the clot has shut off the offending vessel by the time surgical intervention is carried out. This, however, is not invariably the case and it is the surgeon's responsibility to find the bleeding vessel or vessels and seal them before closing the wound. This must be accomplished even though the patient's condition be desperate because failure to do so will almost invariably result in re-accumulation of the clot and a further downward course.

Figure 3 illustrates the typical location of an epidural clot and shows the compression of the underlying hemisphere which compression can be expected to be responsible for contralateral hemiplegia. Figure 4 shows the shifting of the brain substance, particularly of the brain stem, which occurs as a result of the demand for space made by the clot. It also demonstrates (1) the swelling of the white matter which adds further to

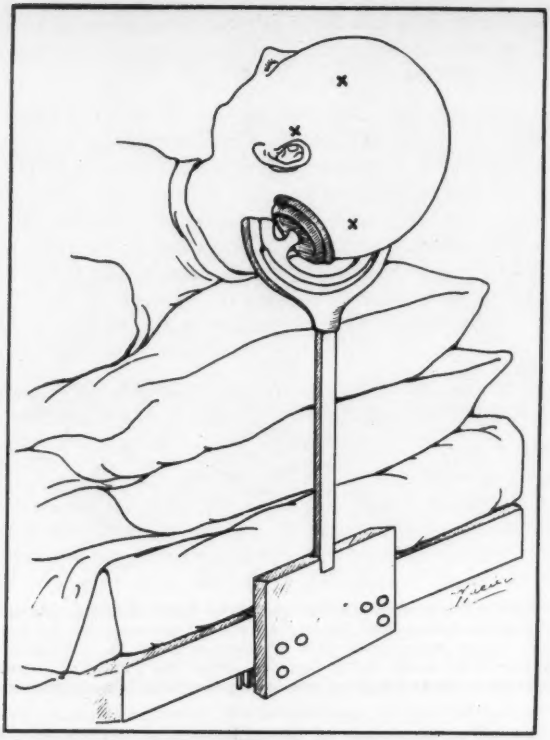


Figure 2.—Head rest designed by Dr. Richard U. Light.

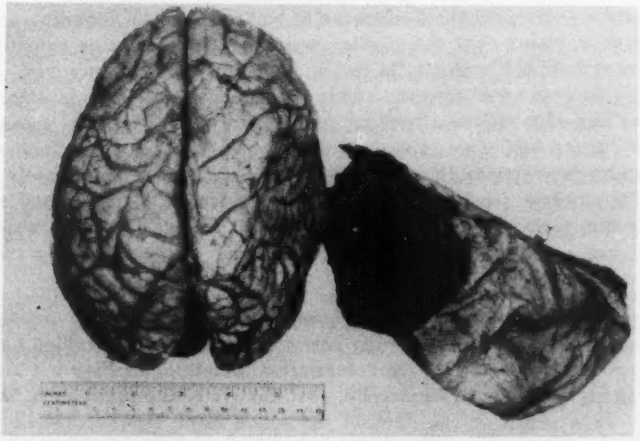


Figure 3.—Epidural clot with cerebral compression.

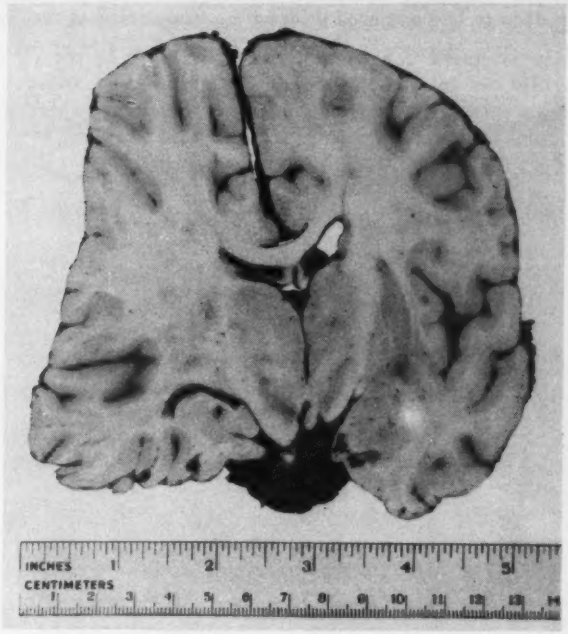


Figure 4.—Brain shown in figure 3 in cross-section.

the demand for space within the right half of the supratentorial fossa, (2) the herniation of the right uncus and right peduncle through the tentorium and of the right cingulate gyrus under the lower edge of the falx, and (3) the ventricular compression.

Figures 5 and 6 show variants of the same mechanism in a case of chronic subdural hematoma, a hematoma which though well tolerated immediately after the injury gave rise to trouble later because with the passage of time, the free blood in the subdural space became encapsulated in an envelope. Presumably as the red blood cells finally broke down within the sac, the osmotic action within the sac increased and tardily, some months later, the hematoma swelled beyond the point of tolerance and acute decompensation occurred *(6)*. The patient whose brain is shown in these figures was injured in May by the hook of a traveling crane. He was not rendered unconscious and except for headache he worked without complaint throughout the summer months, but in September in association with an exacerbation of his headache he became comatose and died within 24 hours following the onset of serious symptoms. His death occurred despite the fact that the hematoma was

(6) Gardner, W. J.: Traumatic subdural hematoma, with particular reference to latent interval. Arch. Neurol. & Psychiat. 27: 847-858, Apr. 1932.

evacuated. His failure to recover indicates, no doubt, that irreversible brain stem damage had occurred prior to the evacuation of the hematoma.

The brain tolerates compression very badly. When the compression occurs rapidly, as in association with an extradural clot accumulating over a period of a few hours, the tolerance is least. In the case of an acute subdural hematoma accumulating over a longer time, the compres-

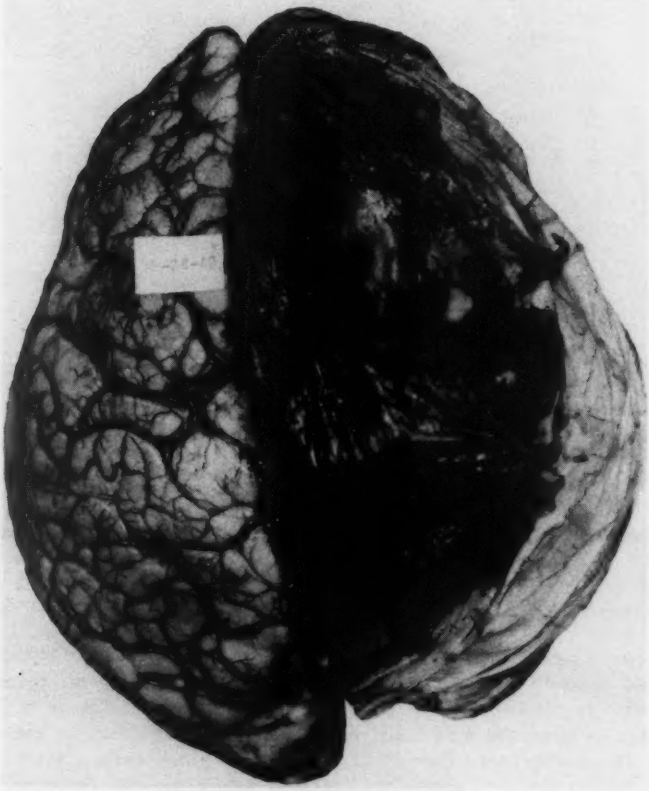


Figure 5.—The left leaf of the dura has been turned over the right hemisphere to demonstrate the nature of the underlying hematoma sac encompassing some residual clot not evacuated at operation.

sion tolerance may be greater. In the case of chronic subdural hematoma, the clot may be tolerated for many months but eventually when the clot finally increases in size, either because of the osmotic action associated with its breakdown or because of further bleeding into the hematoma sac, the compensation may finally be broken acutely. Under these cir-

cumstances, the sequence already described develops. The physiologic explanation of the deepening level of coma which occurs under such circumstances is a problem which will be discussed below.

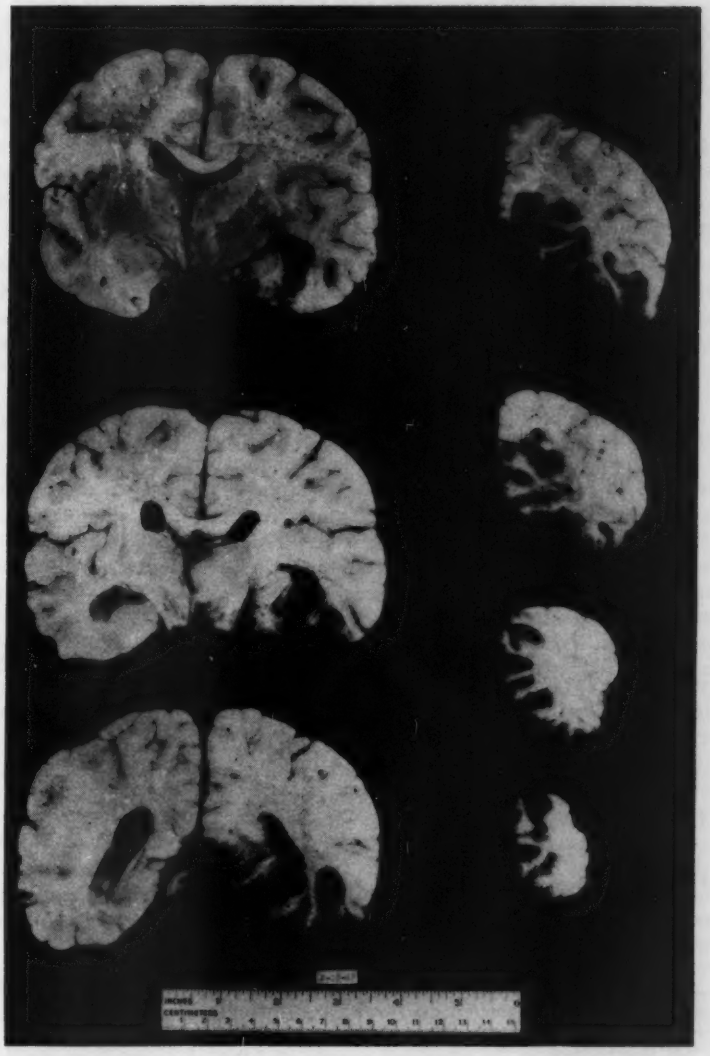


Figure 6.—Cross-sections of brain shown in figure 5. Note the swelling of the white matter and the shift of midline structures.

BRAIN INJURY

One may consider injury to the brain substance itself to be divided into the following groups: (1) concussion, contusion, and its precursor state of edema; (2) laceration; and (3) coalescent multiple areas of bleeding giving rise to intracerebral hematoma, a condition which also presumably may result from the rupture of a normal vessel when sufficient strain is placed on it.

Focal bruising and laceration of the brain may lead to focal cerebral cicatrix and its frequent physiologic counterpart, posttraumatic seizures. Furthermore, diffuse injury to the brain such as may accompany widespread contusion may lead to a general loss of brain substance resulting in posttraumatic atrophy.

The term concussion as here used indicates a state of disrupted consciousness, transient in character, and unaccompanied by demonstrable histologic change. Nothing can be done therapeutically about a state from which recovery has been made in most instances before the physician has a chance to observe the patient.

Enough has been said above in discussing the changes which go on underneath an epidural or subdural hematoma to indicate the reality of cerebral edema. In the early stages of our experimental work we attempted to produce cerebral edema but were unsuccessful in producing a reliable degree of swelling which could be determined by unprejudiced histologic observation. We think from the clinical point of view that edema is probably of chief importance as it occurs under such hematomas and that it may not be of such great significance in association with diffuse brain injury.

The clinical state of cerebral contusion or bruising of the brain is a straight-forward one which may or may not manifest itself on the neurologic examination, depending on whether or not the bruising has occurred in areas whose function can be detected readily. Thus bruising in the frontal region may escape detection entirely whereas a less severe contusion in the motor area might be manifested by profound weakness. Whether the perivascular hemorrhages that characterize contusion are the result of direct tears in the vessel wall (7) or whether they represent diapedesis through vessels presumably damaged by the head injury (8) is still a moot point. Practically speaking, such contusions must be allowed to resolve themselves in the course of natural healing.

Special attention, however, should be drawn to more extensive bruising which, either through coalescence of many adjacent zones of peri-

(7) Denny-Brown, D. E.: Discussion of paper by Evans, J. P. and Scheinker, I. M. See reference footnote (8).

(8) Evans, J. P., and Scheinker, I. M.: Histologic studies of brain following head trauma; post-traumatic central nervous system changes interpreted in terms of circulatory disturbances. A. Research Nerv. & Ment. Dis. Proc. (1943) 24: 254-273, 1945.

vascular hemorrhage or perhaps through the actual rupture of a vessel of some magnitude, results in the development of a hematoma within the brain substance. This is a condition which may closely simulate epidural or subdural hematoma. Exploration for meningeal clot having proved negative, the temptation is to do nothing further in the way of active surgical resolution of the problem. Such intracerebral clots, however, must be pursued vigorously and their identification accomplished either by ventriculography or angiography. In the past 2 years, on the neurosurgical service at the Cincinnati General Hospital, 12 epidural clots have been diagnosed and treated. During the same period, 17 intracerebral hematomas have been diagnosed and have been evacuated with an operative mortality of about 50 percent.

These cases are of particular importance because they are subject to active surgical intervention. To this group amenable to surgical therapy, there should be added another, the best examples of which are cases of contusion of the tips of the temporal lobes and the under surfaces of the frontal lobes, injuries produced in contrecoup fashion when the patient falls on the back of his head. Such cases have been carefully studied by Botterell (9) who has shown that patients suffering from injury of this type are prone to show signs of increasing difficulty in the first few days after head injury and that death may be prevented by the generous aspiration of pulped temporal and frontal lobe tissue carried out through subtemporal openings.

Except for these two groups of cases, and for those requiring evacuation of meningeal clot, there is relatively little that the surgeon can do to alter the situation. In most head injuries the die of future development has been cast when the blow has been delivered. In the present state of our knowledge the surgeon's chief function in dealing with such patients is to improve their general condition so that shock is eliminated, to see to the maintenance of an adequate airway (which may on occasion mean tracheotomy), to provide for the general nutritional needs of the body, and to provide the best possible nursing care, preferably by specially trained personnel. Should the wound be compounded, the role of infection becomes of paramount importance, and in the case of open wounds, removal of damaged tissue and of potentially infected foreign material becomes imperative. Adequate treatment of these patients necessitates considerable knowledge and judgment on the part of the surgeon.

Because suspended consciousness is such a frequent accompaniment of head injury, knowledge of the mechanism of unconsciousness is important. The location of the centers which subserve consciousness has been a subject of much discussion. An increasing body of evidence suggests that the centers related to the sleep state and perhaps to un-

(9) Botterell, E. H.: Disruption of frontal and temporal lobes as a cause of secondary coma following head injury. Paper read at meeting of Harvey Cushing Society, November 14, 1947.

957406 O - 51 - 2

consciousness itself lie in the lower diencephalon and the midbrain. The recent work of Magoun *(10)* and Taylor and Magoun *(11)* indicates that the sleeping and waking states depend on physiologic alterations occurring at these levels. Widespread damage in this region, if this postulate be correct, would then be a source of unconsciousness by virtue of interruption of the physiologic mechanism subserving the waking state. Thus we would have an explanation of the deep coma which we are accustomed to see in the patients who display other signs of midbrain damage such as decerebration.

A second mechanism associated with loss of consciousness is that which accompanies severe injury to the body such as a major fracture. O'Shaughnessy and Slome *(12)* thought that such a loss of consciousness might result from a sudden inpouring of afferent impulses from the traumatized part, which inpouring might be of sufficient degree to disrupt the handling by the central nervous system of the signals reaching it from the periphery. This is probably an oversimplification of the problem but it is perhaps permissible to repeat an analogy which has been previously suggested, that of the overloading of a central telephone switchboard by a sudden influx of calls. One is put in mind of the communications paralysis that occurred following Orson Welles' Men of Mars broadcast. The central nervous system does not have such a simple counterpart but the analogy highlights the loss of consciousness which may occur with severe peripheral injury, a loss which appears to occur too suddenly to be readily explained on the basis of vasomotor syncope.

The third mechanism is that which was elaborated by Denny-Brown and Russell *(13)*. They had observed a mechanic whose head was crushed between a differential housing and the floor when a jack slipped from under the axle of the car on which he was working. Although he suffered severe injury to the skull manifested by bleeding from the nose and the ears, he did not lose consciousness. A consideration of this patient in contrast with those known to have lost consciousness in association with sudden arrest of the head (and body) as it was flying through space, or in contrast with the boxer who, when his head is suddenly accelerated by the blow of his opponent, loses consciousness, led them to set up experiments in which it was possible to demonstrate the basic importance of both sudden deceleration and acceleration of the brain. Their clarification of these effects has been of immense help in understanding more clearly what a moment's reflection will show is the commonest cause of loss of consciousness.

(10) Magoun, H. W.: Caudal and cephalic influences of the brain stem reticular formation. Physiol. Rev. 30: 459-474, 1950.

(11) Taylor, C. W., and Magoun, W. H.: The reticular substance of the brain stem and its relation to wakefulness. A paper read at meeting of the American Academy of Neurological Surgeons, September 1950.

(12) O'Shaughnessy, L., and Slome D.: Etiology of traumatic shock. Brit. J. Surg. 22: 589-618, Jan. 1935.

(13) Denny-Brown, D., and Russell, W. R.: Experimental cerebral concussion. Brain 64: 93-164, Sept. 1941, abstr. Proc. Roy. Soc. Med. 34: 691-692, Sept. 1941.

A fourth mechanism associated with loss of consciousness appears to be common to a number of clinical conditions and has been interpreted by many as a reflection of increased intracranial pressure. Reference has already been made to the deepening level of coma associated with epidural and subdural clots. Neurosurgeons not uncommonly find that a patient on the operating table regains consciousness when fluid under pressure is released from a chronic subdural hematomatous membrane. Other examples might be cited suggesting strongly that the release of increased intracranial pressure is associated with the return of consciousness. The following is a classical instance.

CASE REPORT

Case 2.—A 10-year-old boy was operated on for atresia of the aqueduct of Sylvius subsequently proved to be caused by a tumor. An effort was made to ream out the aqueduct from the fourth ventricle forward. Postoperatively the patient appeared to do well through the afternoon and early evening of the day of operation but at about midnight his condition worsened and by 2 a. m. he was in deep coma, the reflexes, both deep and superficial, were absent, the extremities were flaccid, and the blotchy appearance of the skin indicated peripheral circulatory collapse. The introduction of a needle into the ventricle was accompanied by a rush of air and fluid under pressure. The child shortly after began to stir. In about 2 minutes the deep reflexes had returned and in 4 minutes the child was conscious. Three other episodes occurred in which he became stuporous, lost his deep and superficial reflexes, and developed cortical signs. In each instance, following ventricular puncture, his condition improved. The conclusion seems almost inescapable that his coma was directly related to the increased intracranial pressure.

It was partly in the effort to obtain more accurate data on the importance of intracranial pressure in neurologic lesions that we undertook our present study. The initial effort was directed toward the development of a method which would make possible the continuous recording of lumbar and ventricular pressures. It was thought that in this way we might, among the answers to other questions, find whether or not lumbar puncture is dangerous when the intracranial pressure is increased, but as the work was further developed, it became increasingly evident that a better understanding of the physiologic mechanisms supporting intracranial pressure was imperative. Hence the constantly recording technics originally designed for determination of lumbar and intraventricular pressures were extended to provide observations on other variables particularly those which would give information dealing with cerebral hemodynamics. Figure 7 shows a strain gage attached to a needle. Changes in volume in the lumen of the needle caused by pressure changes within a fluid system affect the diaphragm of the strain gage and alter the electric resistance of the gage. In this way pressure changes may be recorded electrically. Out of this work is developing a large body of information dealing with intracranial pressure states in a variety of con-

ditions *(14)*. A clearer understanding of the physiologic background of spinal fluid formation and absorption appears to be emerging. For the present purpose, attention should be directed to what has been learned in relation to the effect of intracranial pressure on the state of consciousness.

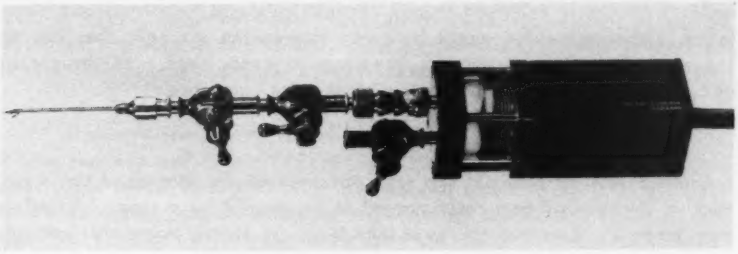


Figure 7.—Strain gage attached to a needle.

In 1901 Cushing carried out a series of observations on animals in which he indicated that sharp increases in intracranial pressure approximating the mean arterial pressure were associated with medullary collapse *(15)*. In the following year he drew a parallel between these observations in the experimental animal and the clinical state of patients suffering from intracranial hemorrhage *(16)*. By inference it was suggested that increased intracranial pressure of significant degree occurred in these patients and was responsible in part at least for their disturbed states of consciousness.

On the other hand we have now developed data which indicate clearly that intracranial pressure, of much higher values than those previously measured (figs. 8 and 9), is not associated with alterations in the level of consciousness and it no longer seems tenable that increased intracranial pressure of the degree commonly associated with head injury is sufficient to disrupt consciousness *(17)*. Hence we must seek another explanation of the coma commonly accepted as being caused by increased intracranial pressure.

It was suggested in discussing the first mechanism, that of injury which disrupted the midbrain centers presumed to be subserving con-

(14) Ryder, H. W.; Espey, F. F.; Kristoff, F. V.; and Evans, J. P.: Observations on interrelationships of intracranial pressure and cerebral blood flow. J. Neurosurg. 8: 46-59, 1951.

(15) Cushing, H.: Concerning a definite regulatory mechanism of vasomotor center which controls blood pressure during cerebral compression. Bull. Johns Hopkins Hosp. 12: 290-292, 1901.

(16) Cushing, H.: Blood pressure reaction of acute cerebral compression. Am. J. M. Sc. 125: 1017-1044, 1903.

(17) Evans, J. P.; Espey, F. F.; Kristoff, F. V.; Kimbell, F. D.; and Ryder, H. W., with the technical assistance of Lamb, D. A.; Barnes, E. B.; and Young, D. J.: Experimental and clinical observations on rising intracranial pressures. (To be published in Archives of Surgery.)

Figure 8.—Amplifiers and 6-channel ink-writing oscillograph used in constant recording of the pressure changes in ventricles, lumbar subarachnoid space, brachial artery, and jugular vein. ECG's may also be obtained as in this instance.

sciousness, that these centers are related to those studied by Magoun and his collaborators in their investigation dealing with the sleep mechanism. We should like to suggest tentatively that it is these same centers which are affected when the midbrain is *displaced* by meningeal clots, or other space-consuming lesions. There is no clear-cut evidence that high intracranial pressure is a prerequisite for disturbed function

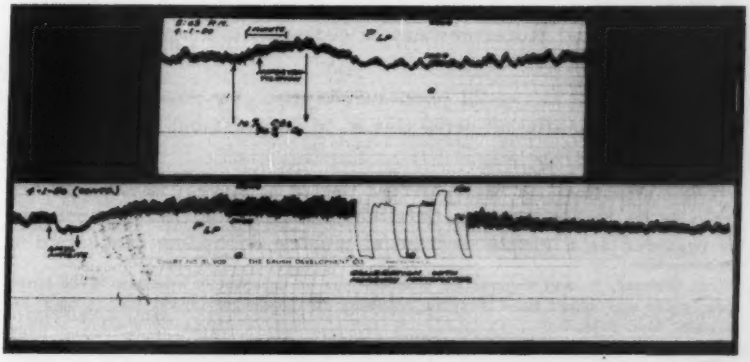


Figure 9.—An example of a single-channel tracing recording the lumbar puncture pressure of a patient with increased intracranial pressure caused by a brain tumor. The tracing suggests the possibilities of the method for physiologic investigation.

of these centers. Possibly the compression of tissues or the compression of nutrient vessels, is the important factor; and possibly these disturbances are accompanied only pari passu by increases in intracranial pressure.

We have come then to the conclusion that increased intracranial pressure per se is not a matter of consequence in the range of pressure seen in anything other than the terminal stages of illness. We believe that for practical purposes, increased intracranial pressure is of diagnostic value indicating something of the clinical state but not of itself constituting a threat to the patient's welfare. So far as head injuries are concerned this is a conclusion previously drawn by Browder and Meyers *(18, 19)* and Meyers *(20)*.

We are anxious to extend these observations not only in relation to head injury itself but also in relation to other clinical states because we need to understand much more clearly the mechanisms behind the formation and absorption of cerebrospinal fluid and because the observation of pressure changes in a wide variety of states places our conclusions on firmer ground and gives greater credence to them. If we can conclude from these studies that increased intracranial pressure need no longer be a matter of grave moment for the neurosurgeon in evaluating therapy, then the problem of the treatment of head injuries is much clarified and investigative efforts toward a better understanding of the condition may be directed into other channels.

SUMMARY

Any head injury is apt to present a complex clinical problem, subject to analytical study, which study through its provision of a clearer understanding of the functional disturbance should make for a more rational therapeutic approach. The treatment of scalp injuries is a problem which demands the application of the best general surgical principles. Formidable plastic procedures may be necessary to restore the integrity of the scalp.

Skull fractures become of importance if they give rise to intracranial hemorrhage, to tearing of nerve tissue, to compression, or to the introduction of infection.

Chief attention has been directed toward meningeal hemorrhage and brain injury proper. On superficial consideration the first of these may be regarded as a simple mechanical problem demanding evacuation of

(18) Browder, J., and Meyers, R.: Observations on behavior of systemic blood pressure, pulse and spinal fluid pressure following craniocerebral injury. Am. J. Surg. 31: 403-426, Mar. 1936.

(19) Browder, J., and Meyers, R.: Behavior of systemic blood pressure, pulse rate and spinal fluid pressure associated with acute changes in intracranial pressure artificially produced. Arch. Surg. 36: 1-19, Jan. 1938.

(20) Meyers, R.: Systemic vascular and respiratory effects of experimentally induced alterations in intraventricular pressure. J. Neuropath. & Exper. Neurol. 1: 241-264, July 1942.

the hematoma. Further analysis demonstrates that the problem is much more complex and that the significance of the hematoma depends primarily on the changes that it produces in the underlying brain.

With the exception of the evacuation of intracerebral hematoma and of pulped brain tissue, there is relatively little which the surgeon can offer in treating brain injury over and above the natural healing processes. It is imperative that the patient be placed in the best general physiologic state. This means the elimination of shock, the provision of an adequate airway, and the maintenance of the optimal nutritional state and a normal fluid intake and output. Intelligent and adequate nursing care is imperative.

Impairment of consciousness may result from (1) direct injury to those centers which subserve consciousness; (2) inordinate bombardment of these centers by afferent impulses in association with peripheral injury; (3) sudden acceleration or deceleration; or (4) distortion of the midbrain structures. Our evidence would seem to indicate that when high intracranial pressure is distributed equally, it has no effect on the level of consciousness except perhaps when the intracranial pressure in a human being is raised to the point where it approximates the mean arterial pressure. We have no evidence in human subjects to bear on this last critical stage. It would seem, however, that for all practical purposes increased intracranial pressure is but an index of disturbance of cerebral function, and is not in itself significant. The elimination of increased intracranial pressure as a factor which needs in its own right to be considered in the treatment of head injury, is an important step in the better understanding of such trauma and the planning of therapy.

THE ARMY LIBRARY
WASHINGTON, D. C.

Hematology, Diagnosis, and Therapy of Radiation Injury[1]

Eugene P. Cronkite, *Commander, MC, U. S. N.*

FROM the practical standpoint, uniform whole-body exposure to ionizing radiation will rarely occur after an atomic explosion because of shielding of the body by concrete, steel, or other intervening objects. In the laboratory, whole-body exposure to ionizing irradiation is so arranged as to deliver a field of radiation that is homogeneous, with the aim of delivering equal amounts of radiation to all tissues throughout the body [2] [3]. This does not occur, however, because the absorption of radiant energy varies with the tissue density. In the laboratory it is necessary to maintain uniform, reproducible conditions in order to study the effects of radiation. These laboratory conditions are not necessarily those which existed in respect to radiation exposures in Japan or which may occur at some future date.

The effects of shielding, therefore, become of great importance as shown by the fact that in guinea pigs the 50 percent lethal dose (L.D.$_{50}$) of radiation is about 250 r. If the extremities are shielded, the L.D.$_{50}$ is increased to 600 to 800 r. If the abdomen is shielded, the L.D.$_{50}$ dose may be increased to 1,000 r. In mice, Jacobson [4] [5] has demonstrated that shielding of the spleen, with exposure of the rest of the body almost doubles the 30-day L.D.$_{50}$ for this species. Bond [6] has demonstrated in rats a great difference in the L.D.50

---

[1] Presented as part of course on Medical Aspects of Special Weapons, Naval Medical School, National Naval Medical Center, Bethesda, Md.

[2] Chapman, W. H., et al.: Experimental procedures for exposure of large numbers of animals to total body X-radiation. Project 006 012.05.03, 3 July 1950, Naval Medical Research Institute, Bethesda, Md.

[3] Chambers, F. W., et al.: Output characteristics of a commercial x-ray generator. 7 Dec 1949, Project 006 012.08.26, Naval Medical Research Institute, Bethesda, Md.

[4] Jacobson, L. O., et al.: Role of spleen in radiation injury. Proc. Soc. Exper. Biol. & Med. 70: 740-742, Apr. 1949.

[5] Jacobson, L. O.; Simmons, E. L.; Marks, E. K.; Robson, M. J.; Bethard, W. F.; and Gaston, E. O.: Role of spleen in radiation injury and recovery. J. Lab. & Clin. Med. 35: 746-770, May 1950.

[6] Bond, V. P., et al.: Sensitivity of abdomen of rat to X-radiation. Naval Radiological Defense Laboratory, U. S. Naval Shipyard, San Francisco, Calif. (To be published.)

for rats with the abdomen shielded as compared to the $L.D._{50}$ with abdomen exposed. Similar studies have been performed shielding the adrenals, head, portions of the extremities, and other organs. All shielding experiments tend to increase the resistance to radiation and to modify the response of the hematopoietic organs.

HEMATOLOGIC EFFECTS OF RADIATION

The mechanism by which radiation induces changes in the peripheral blood.—There is no evidence that cells, other than the lymphocytes, in the circulating blood are injured by radiation in amounts of radiation that produce the lethal range. With supralethal amounts of radiation up into the thousands of roentgen units, injury to the cells in the peripheral blood can be produced. This, however, is of no practical importance. The direct irradiation of blood cells in vitro or in ligated vessels with amounts of radiation that produce the lethal range does not produce morphologic injury of these cells in a reasonable observation period. All evidence points to destruction of the stem cells (blasts) as being responsible for the changes that take place in the peripheral blood (7) (8). In other words, the changes in the number of cells in the peripheral blood of animals follow the normal attrition following cessation of production by the hemopoietic organs.

The injury to the blasts may result in: (1) their complete destruction so that regeneration is unlikely; (2) their partial destruction; or (3) interference with their maturation. The relative injury to the formative cells determines to a large extent the changes in the peripheral blood. If erythroblasts are completely destroyed, the attrition of the erythrocytes in the peripheral blood will be a function of the life span of the erythrocyte unless other factors intervene. Similarly, when production of lymphocytes, platelets, or granulocytes cease, the rate at which they disappear from the circulating blood will be a function of their usual life span and the demand for these elements.

Effects on the erythroid system.—The erythroblasts are as sensitive as any of the blasts. Immediately after exposure to lethal amounts of radiation, they show obvious signs of cellular injury such as pyknosis, karyorrhexis, disturbances in the chromatin pattern, cessation of mitosis, and rapid disappearance. The changes in the level of erythrocytes in the peripheral blood are caused by: (1) the cessation or interference with their production; (2) their increased destruction as manifested by marked erythrophagocytosis and increased urobilinogen excretion; and (3) profound hemorrhagic tendency that develops in most animals exposed to more than an $L.D._{50}$. The change in the level

(7) Lawrence, J. S.; Dowdy, A. H.; and Valentine, W. N.: Effects of radiation on hemopoiesis. Radiology 51: 400-413, Sept. 1948.

(8) Cronkite, E. P. in Behrens, C. F.: Atomic Medicine. Thomas Nelson & Sons, New York, N. Y., 1949. pp. 103-122.

of circulating erythrocytes is relatively slow because of the long life span of most mammalian erythrocytes. The human erythrocyte has a life span of roughly 120 days; therefore, under normal conditions in each person about 1 percent of the erythrocyte mass is destroyed and produced each day. It follows that if no erythrocytes are being produced, there will be a deficit of about 1 percent per day. Following exposure to lethal amounts of radiation, there is a minimum deficit of this 1 percent per day (in addition to the erythrocytes lost by their increased destruction and those lost by the hemorrhagic tendency or from wounds or other injuries) until regeneration occurs.

Effects on the granulocytes.—The pattern of response in the granulocytes of the peripheral blood is a function of the amount of radiation that has been received. With very high doses of radiation, the drop is precipitant and takes place almost immediately, reaching the minimum value in from 3 to 4 days after exposure. There is no tendency for a rebound as is seen with lower doses of radiation such as the L.D.$_{50}$. The life span of the granulocyte has been estimated as being from 1 to 4 days. Hence, with no production, their disappearance will be rapid.

Effects on the lymphocytes.—With doses of radiation above 50 r, the initial response of the lymphocyte is uniform. Immediately after exposure, there is a prompt drop in the lymphocyte count. The degree of the depression is a function of the dose of radiation up to the low lethal doses, where the response of the lymphocyte becomes maximal. Lymphocytes reach their minimum value in 24 to 48 hours. About 90 percent of the depression takes place in the first 18 to 24 hours, with a subsequent slower drop. With low doses of radiation, beneath the lethal range, there is a tendency for the lymphocytes to recover rapidly, and there may be a subsequent drop or oscillation in the count for a matter of days or weeks before it again becomes stabilized. With higher doses of radiation above the L.D.$_{50}$, there is no, or at best, a very slight, tendency of the lymphocytes to reappear in the peripheral blood.

The effect on the blood platelets.—With doses of radiation above L.D.$_{100}$ in dogs, there is a general tendency for the platelet count to increase slightly in the first 3 to 4 days after exposure. The platelets then disappear linearly for about 6 days, approaching zero around the ninth to tenth day after exposure. It is of interest that megakaryocytes are present in the bone marrow for the first 3 or 4 days in significant numbers. During the same period of time, erythoblasts, lymphoblasts, and myeloblasts have been completely destroyed, and nothing more immature than a metamyelocyte is found. With the decrease in the blood platelet count, there is a well-correlated increase in the whole-blood clotting time. The increasing clotting time that parallels the decreasing platelet count is not proof that the thrombopenia is the cause of the decreased coagulability. With lower levels of radiation,

particularly below L.D.50, there are minimal changes in the platelet count *(8-10)*.

The hemorrhagic manifestation of acute radiation injury above L.D.50 usually takes the course of a florid purpura, but other hemorrhagic manifestations, such as hematomata, bleeding from the nose, or bleeding into the gastrointestinal tract and the urinary tract without diffuse purpura are also seen. The factors that predispose to hemorrhage in the potentially fatally-irradiated person in their relative order of importance are: (1) the marked thrombocytopenia with the associated clotting defect (fragile nonretractile clot); (2) ulcerations into blood vessels from the ulcers that occur in the mucosa of the mouth and gastrointestinal tract; (3) an increased capillary fragility; and (4) an inconstant clotting defect at times ascribable to an anticoagulant *(9-11)* the nature of which is undetermined. This anticoagulant has been considered as heparin or heparinlike by Allen, et al. *(11)* but others *(9)* deny its heparinlike characteristic, and some deny the existence of a clotting defect or an anticoagulant *(12-14)*. The clotting defect could be caused by a diminution in the antihemophilic or accelerator factors. The nature of the clotting defect and means by which it can be combated are under study in many laboratories.

The value of hematologic observations in the prognosis of radiation illness:

1. The absolute lymphocyte count is a good index of the relative exposure to radiation in the sublethal range.

2. A reticulocytosis is usually, but not always, followed by recovery from radiation injury.

3. Death usually occurs if the granulocytes fall below 1,000 per cu. mm., if platelets disappear, or if the clotting time is prolonged with concomitant purpura.

4. Survival usually follows if the granulocytes remain above 1,500 per cu. mm.

---

(9) Jackson, D. P.; Cronkite, E. P.; and LeRoy, G. V.: Further studies on radiation hemorrhage. (To be published 1951.)

(10) Cronkite, E. P.: Hemorrhagic syndrome of acute ionizing radiation illness produced in goats and swine by exposure to atomic bomb at Bikini, 1946. Blood 5: 32-45, Jan. 1950.

(11) Allen, J. G., et al.: Heparinemia (?). Anticoagulant in blood of dogs with hemorrhagic tendency after total body exposure to roentgen rays. J. Exper. Med. 87: 71-86, Jan. 1948.

(12) Rosenthal, R. L., and Benedek, A. L.: Effects of total body X-radiation on blood coagulation in the rabbit. II. Biological studies of radiation effects. University of California Radiation Laboratory, USAEC Document Uncl. AECU-592, 22 Feb. 1950.

(13) Holden, W. O., et al.: Hypothromboplastinemia following total body irradiation. Proc. Soc. Exper. Biol. & Med. 70: 553-556, Mar. 1949.

(14) Field, J., and Rekers, P.: Ionizing irradiation disease and study of protective nature of flavonones. MDDC-1672, USAEC declassified document, University of Rochester, 1948.

THE DIAGNOSIS OF RADIATION INJURY

Following explosion of an atomic bomb high in the air, as occurred at Hiroshima and Nagasaki, there will be degrees of radiation injury varying from sublethal to supralethal. In addition, radiation injury will be combined with thermal or traumatic injuries. For purposes of administering the best care possible to survivors, the diagnosis of the relative degree of radiation injury and segregation into treatment groups is essential. For purposes of triage an arbitrary division of the population exposed to atomic bomb radiation may be made into:

Group 1: Survival from radiation injury is improbable (supralethal).

Group 2: Survival from radiation injury is possible (the lethal range).

Group 3: Survival from radiation injury is probable (sublethal) *(15)*.

Attempts to segregate a population into these three groups may be based on: (1) distance from the explosion; (2) personnel radiation dosimeter readings; and (3) symptoms.

Drawbacks to using distance as a basis are: (1) the amount of shielding is not known; (2) the size, yield, and height of bomb are not known immediately; and (3) uniform radial distribution is not assured because of terrain, buildings, et cetera.

Drawbacks to using personnel dosimeter readings as a basis are: (1) they are not yet available in large numbers; (2) they are not independent of energy; (3) the lethal range is not established for man and may vary from 100 to more than 600 r; (4) the absolute sensitivity for any given person can not be ascertained; (5) the possibility of the dosimeter being shielded or exposed is always present; and (6) some may survive 600 r whereas others may die with exposure to 200 r.

The *symptomatologic approach* is not perfect, but has the following advantages: (1) the relationship of symptoms and the tempo of the illness to probable death, possible survival, and probable survival are well known on the basis of Japanese data; (2) the symptoms as observed in the Japanese are dependent on dose ranges rather than on a specific dose; and (3) no equipment is needed except clinical observation and judgment.

By and large, the simplest approach to the diagnosis of the relative degree of radiation injury is by the evaluation of symptoms. Using the symptoms as observed in the Japanese casualties, the following will be observed in Group 1: vomiting within a few hours of the bombing progressing into prostration, diarrhea, anorexia, fever, and early death; and a profound depression in the leukocyte count within 48 hours. The mortality will be close to 100 percent.

---

(15) Cronkite, E. P.: Diagnosis and therapy of radiation injury. West. J. Surg. (In press 1951.)

In Group 2 casualties, vomiting will likewise occur on the day of bombing, but will subside within a matter of hours. Following the vomiting, there will be an asymptomatic latent period of from 1 to 3 weeks which will be terminated by a recrudescence of the illness associated with purpura, epilation, oral and cutaneous lesions, infections of wounds or burns that were otherwise healing well, and bloody diarrhea. The mortality of this group will be about 50 percent without treatment.

In Group 3 casualties, there will be no vomiting on the day of the bombing. The late symptoms, if any develop, will be similar to those of Group 2. Without the development of late symptoms, this group can be detected only by serial studies of the leukocytes. The mortality will be practically nil if uncomplicated by burns and trauma. Recent studies *(16)* have shown that the additive effect of sublethal amounts of radiation and sublethal thermal burns in the dog results in a very high mortality. A similar phenomenon may exist with man.

THE THERAPY OF RADIATION

Practical considerations.—Group 1 casualties present no major therapeutic problem because, with our current knowledge of radiation injury, there is nothing that we can do to improve survival rates of persons or animals exposed to supralethal amounts of radiation. Group 3 casualties present no therapeutic problem for the immediate post-explosion period unless complicated by thermal burns or traumatic wounds. Group 3 along with Group 2 survivors will constitute the major long-term problem so far as study of the population for possible latent effects of radiation (cataracts, leukemia, cancer, and possible genetic effects of radiation in the offspring) is concerned.

The major therapeutic problem, then, is the treatment of persons in Group 2. The lethal factors in this group are infection, hemorrhage, anemia, and disturbance in the acid-base and electrolyte equilibrium. Prevention, combating, and reversal of the above four hazards constitutes, therefore, the therapeutic objectives in treating this group of casualties. Impaired resistance to infection exists because of the profound granulopenia and the impaired antibody production. In the granulopenic states, infection may be caused by truly pathogenic organisms, but generally results from the organisms that live in and on the human body in a commensal or symbiotic relation under conditions of good health. The therapeutic problems concerned with the development of the infections are both prophylactic and active.

The prophylactic phase raises some difficult problems. If antibiotics are given too soon, the organisms in the oral cavities and the gastrointestinal tract may develop a definite resistance to the antibiotic and when its effectiveness is most needed it may be impotent. There

(16) Evans, I., et al.: Radiation and thermal burn studies. Presented to National Research Council Symposium on Burns, Nov. 1950.

is no way that one can specifically designate the optimal time to start giving antibiotics. As a general rule, the occurrence of ulcerations and elevated temperature, the presence of burns or wounds, or other clinical evidence of infection would seem to be an absolute indication for the vigorous use of antibiotics orally and parenterally. From the prophylactic standpoint, antibiotics should be given orally about 7 to 10 days after exposure or when the leukocyte count is below 1,500. The antibiotics should be given until the leukocyte count exceeds 1,500. The choice of antibiotics will be determined to a certain extent by availability and the amount of nursing care that will be feasible. In the early stages, it will probably be practicable only to give penicillin and aureomycin by mouth. Chloramphenicol may also be a helpful oral adjunct. Careful attention to personal hygiene, care of the teeth and mouth, lips and skin will help to prevent the development of infections, along with a meticulous aseptic technic in giving hypodermic injections.

The hemorrhagic phase.—The treatment of this phase is not at all satisfactory. The causes of radiation-induced hemorrhage are fairly well understood and include (1) thrombopenia; (2) ulceration into the blood vessel; (3) increased capillary fragility; and (4) an inconstant blood coagulation defect, sometimes with a nebulous circulating anticoagulant. The replacement of platelets by transfusion is still impractical and unsatisfactory even under rigidly controlled laboratory conditions. Ulcerations into the blood vessels can be controlled in part by controlling the infectious ulcerations. Various drugs (rutin, vitamin P factors, and various flavonones) have been considered of value in controlling the increased capillary fragility, but of these none have been shown to be of value in radiation injury to date. If the blood coagulation defect were caused by heparin, it could easily be neutralized by the judicious use of protamine sulfate and toluidine blue intravenously, but, these agents have not controlled the hemorrhagic tendency nor increased survival time or survival rate. There is much disagreement as to whether heparin plays any role in the hemorrhagic tendency of radiation injury. Drugs for combating the first phase anticoagulants that are suspected by other investigators have not been developed.

Treatment of the anemia.—The causes of the anemia have been previously considered, namely, (1) cessation of erythrocyte production, (2) increased destruction of red blood cells, and (3) hemorrhage. The anemia can be satisfactorily combated by ample whole blood or washed red blood cell transfusions, whichever may be available. The amounts of blood that will be necessary can be estimated. A minimum deficit of 1 percent per day for about a month, will, on the average, equal 50 ml. of blood per day, or a total of 1,500 ml. To this must be added the amount lost by hemorrhage and by increased destruction of blood. A minimum of about 5 units of blood will be needed for each radiation casualty during the first month after exposure.

Disturbances in acid-base and electrolyte equilibrium and their management are so well known in general clinical practice that it is not necessary to comment on them in this article.

SUMMARY

If vomiting occurs on the day of the bombing and is followed by diarrhea, prostration, continued vomiting, anorexia, and fever, survival is improbable, and death will occur in a matter of days. If vomiting occurs on the day of the bombing and is followed by an asymptomatic period of from 1 to 3 weeks before recrudescence of the typical symptoms of radiation injury (purpura, epilation, ulcerations of the mucous membranes, and gastrointestinal disturbances) occur, survival is possible. If there is no vomiting on the day of the bombing, survival is almost certain, unless there are complicating factors such as burns, thermal or traumatic injuries, or concomitant epidemics.

There is no simple routine for treating radiation injury. The pancytopenia temporarily induced by potentially lethal amounts of radiation is, from the therapeutic standpoint, essentially no different than the pancytopenia temporarily induced by drugs or infections nor is it different than the idiopathic types of pancytopenia. Under ideal conditions, each person would constitute a separate therapeutic problem in which the course to be followed would be dictated by the good clinical judgment of the physician in charge, following well-established therapeutic principles for the treatment of pancytopenias in general. There is no obvious reason why the temporarily-induced pancytopenia of radiation injury will not respond to treatment as well as the temporary drug-induced pancytopenia.

In due course of time, general rules will be laid down by the Military Establishment, the National Security Resources Board, and Office of Civilian Defense proposing realistic schedules for the use of antibiotics and whole blood that will be consistent with the available stockpiles and probable future stockpiles that are being planned for times of catastrophe and that will be consistent with the procurement of blood by the National Blood Program. These schedules will be modified from time to time as preparation for atomic warfare improves.

Basic Airborne Training

Douglas Lindsey, *Major, MC, U. S. A. (1)*

Thomas G. Nelson, *First Lieutenant, MC, U. S. A. (1)*

COMMON knowledge of airborne training is based somewhat less on current fact than on persistent legend perpetuated without malice by members of the great airborne fraternity itself. The notions that new airborne recruits bring with them to the school at Fort Benning are bewildering, humorous, and almost weird. We know because we were recently recruits there ourselves. As a factor in discouraging volunteers, perhaps just as important as the legends about airborne training, are the items that are left unsaid. The fear of the unknown and the lack of definite knowledge of what to expect at jump school is a strong deterrent to prospective applicants for airborne training.

We have heard it said, often and apparently honestly; "It's not the jumping I would mind, but I don't know whether I could take the 6 weeks of training at Benning." This period has been cut to 3 weeks, and has been so changed that some of the old-timers would not recognize it for the same course. It is, moreover, doubted that it ever was as bad as it was said to be. That there have been improvements in the technic of airborne training and in the jump technic is graphically presented by the fall in training injury rates (fig. 1). In 1942 and 1943 the injury rate was about 5 percent, and on occasion ran as high as 13 percent. Since 1948 it has been about 0.04 percent. For all practical purposes, parachute jump training is no more hazardous than military training in general.

In our case, probably typical, we approached airborne training with trepidation. We knew little and feared the worst. For one of us, personal knowledge of airborne training was limited to the experience of two colleagues who entered airborne training early in World War II, both of whom suffered acromioclavicular separations. Memory of something called the parachute fracture" welled up from past orthopedic instruction, and there were new stories of how harsh the instructors were and how tough their punishments. Our fears were not substantiated.

No acromioclavicular separations were observed after the school stopped teaching tumbling as a method of landing. About the same time it became evident that the "parachute fracture" could be attributed to

(1) Fort Monroe, Va.

957406 O - 51 - 3

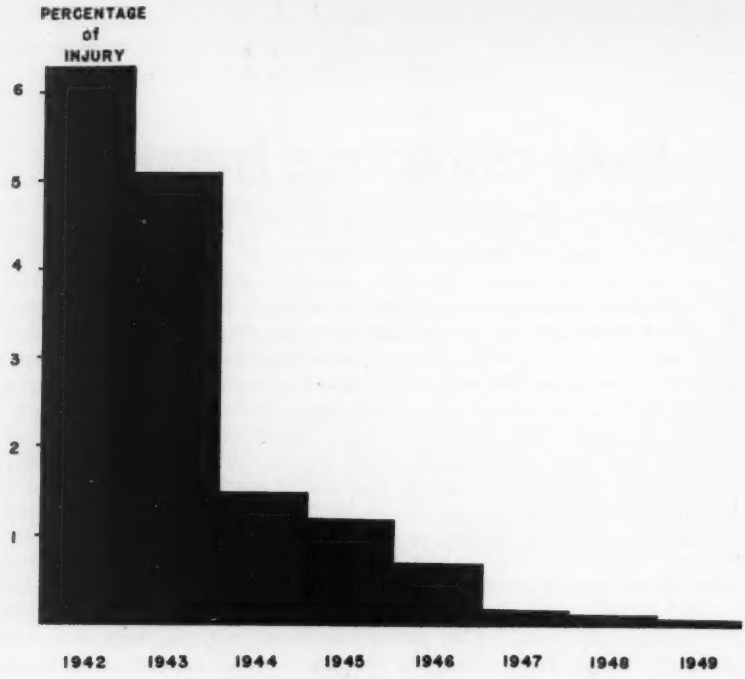


Figure 1.—Injuries in training, Basic Airborne Course, The Infantry School, Fort Benning, Ga.

the technic then being taught of landing with feet about 18 inches apart. Now the feet are kept together, and ankle fractures have ceased to be a typical or frequent injury. The instructors were not only capable, but conscientious and courteous. It went this way: "That which you just did will cost you a few push-ups. Would you mind assuming the leaning rest position and knocking them out?" We found that the maximum punishment for infringement on or deviation from the strict rules and standards of the school was 10 push-ups, not 50 as rumored.

With the intent of encouraging more officers of the Medical Service to enter airborne training and duty the following discussion of the current basic airborne training program is presented. The need for officers of the medical branches in airborne units is definite and continuing. In view of the present military situation many officers can expect transfers from hospitals to tactical units. These officers should consider the advantages of choosing an airborne unit. Junior officers may well consider the additional pay. Career officers should certainly realize that to a large degree the future of our Army lies with airborne units and it behooves them to learn something about them.

Entering airborne training is a simple process. At present the student must be a volunteer. There are age limitations and physical standards, but these do not require that the student be in the bloom of youth or have the build of a college athlete because waivers are readily available. Our classes included captains and master sergeants approaching the fifth decade, 45-year-old majors, and older senior officers. One colonel, now a brigadier general, was in the process of retirement when the Korean war broke out. He withdrew his retirement application and substituted an application for jump school. He breezed through with such ease as to be the envy of many of us who were junior to him.

On paper the physical standards for parachute training are rather rigid, but as in the case of all such standards it is the functional ability, not the anatomic abnormality, that counts. The discretion of the medical examiner is enjoined; apparently disqualifying defects must be appraised in the light of general capabilities and the requirements of duty commensurate with age, grade, and branch. The Judge Advocate in our class jumped with full dentures, and neither swallowed a plate nor bruised a gum. Visual defects are no problem. The presbyopic person does beautifully. Not until his regiment is safely on the ground and a command post is set up does the colonel need to shuffle through his baggage for glasses to read a map. The hyperopic person does just as well. The myopic person does well enough. No great visual acuity is needed to get through the door, to handle a parachute in the air, or to land on a given drop zone—the last provided that the pilot is on the ball and that someone who is not myopic is jumpmastering the stick or checking the jumpmaster. For those who are really lost without glasses and cannot wait until landing to put them on, no special shatterproof goggle is required. Metal-rimmed glasses with the old-fashioned tight circling earpieces will stay on without difficulty. Glasses with the looser plastic frames are likely to come off during the exit because of the propeller blast or the opening shock, and they require a little stabilization by pieces of cellophane or adhesive tape across the bridge of the nose.

While a certain suppleness and general integrity of the trunk and its appendages is desirable, one need not be a perfect physical specimen. We have seen an officer make four jumps in a week following a lateral ligament tear which was sustained in a touch football game. He took a risk of damaging the intact extremity because of the instinctive favoring of the injured limb on landing. We do not recommend such perseverance, but he got away with it without further injury. We have seen one man jump with a known march fracture, and another during the week following a hemorrhoidectomy. He placed a pad in the appropriate place and went right ahead. Incidentally, large-sized "sanitary pads" were sold in the airborne area post exchange because recruit jumpers found them useful in padding the harness—over the shoulders, across the sternum, and in the adductor region of the thigh.

Besides the standards to be met on physical examination there is now required a minimum level of physical conditioning. In the short course time can no longer be given so freely to the conditioning of students after arrival at the school. If a candidate is in reasonably good physical condition he can make some 200 points on the standard physical fitness test on the first try. If he is not in reasonably good physical shape he should work out for a week or so before applying. Although we can give specific and personal evidence that it is possible to go to jump school direct from a sedentary occupation, we are convinced that a little preparation is well worth while.

In a period of from 7 to 14 days, depending on your build and previous condition, you can prepare yourself to take the course in easy stride. The lean and hungry usually have it easier than the wider and well-fed, but all can make it if they try. It will be convenient if, before you arrive at jump school, you are able to do 6 pull-ups (they are not stressed at school), 25 push-ups (they are greatly stressed), 40 sit-ups, and 35 squat jumps. Running provides a great part of the physical conditioning of the paratrooper. There are short runs at standard double-time cadence, and longer runs at the slower speed of the famous airborne shuffle." The maximum run is about 4½ miles, made in about 50 minutes, running 8 minutes and walking 2 minutes. If you can accomplish any part of the conditioning mentioned above, persisting in spite of the soreness that will afflict you for the first few days, it will help greatly. If you are able to do the exercises mentioned, vigorously and in the numbers specified, with less than 15 seconds rest between exercises, you will, as they say, "have it made." We strongly recommend a complete rest of 2 days before the course actually begins. Your orders will provide for your arrival at Fort Benning a few days early.

A pair of combat boots or parachute boots should be broken in while you are undergoing your preconditioning. Some cloth insignia of branch and grade should be sewed on 3 or 4 sets of fatigue clothing. The metal insignia are a minor hazard in some of the training.

Other than the act per se of volunteering for airborne training no bravado is required. The parachutist is no daredevil, but a soldier who has learned to enter combat by a third dimension. Our classmates were sober, homeloving, and, until the night after the first jump, rather quiet. To our knowledge no case of rape or mayhem was attributed to our training companies, and all assault and battery was intramural or academic, and then usually for sufficient cause. The parachutist is a better than ordinary soldier, but is not from a different mold. In this light the results of a school survey are of interest: the student most likely to complete the course is about 5 feet 9 inches tall, college-trained, with an Army General Classification Test score of 110 and a clerical Military Occupational Serial number.

Virtually the entire 3-week course is devoted to jump training; 96 hours are so labeled. The 6 hours listed as general training are closely related, being made up of an introduction to the basic airborne course, and a number of training films and instructional periods on aerial resupply and airborne assembly procedures. The 9 hours of physical training and 3 hours reserved for the troop information program are minimum Army-wide requirements in these fields.

The very few hours devoted to physical training are a distinct and recent change. Formerly a high point in the course, and for many of us the greatest hurdle, was the physical fitness test in the next-to-last week of the old 5- or 6-week course. Unless you passed that test you were not permitted to jump, and the physical and psychologic stress was great. Now a certain level of physical efficiency must be evidenced prior to entering jump school, and the physical training program, though intense, is routine.

The technics taught in the 96 hours of parachute training are: (1) procedure in the aircraft prior to exit, (2) technic of exit and proper body position for exit and opening shock, (3) procedure during descent, and (4) landing. The instructional sequence is not exactly parallel to this listing, and the various aspects proceed concurrently. The first introduction to parachute training is the mock-up door—a frame replica of the fuselage or rear door section of a C-82 or C-119 aircraft (fig. 2). Here the student begins an intensely repetitious but progressive series of exercises on the 7 jump commands, those commands given by the jumpmaster which control the prejump procedure in the aircraft. These commands are:

Get ready
Stand up
Hook up
Check your equipment
Sound off for equipment check
Stand in the door
and
Go

Using dummy parachute equipment, all the six preliminary commands are executed in the mock-up just as in the airplane door. On the final command of *Go* the student exits from the mock-up, landing 2 to 4 feet below in a sawdust pit.

The next step in the training is the 34-foot mock-up tower (fig. 3). Here the commands of *Stand in the door* and *Go* are executed with the added features of height and a jump shock. In this mock-up the student's harness is hooked onto risers attached in turn to a trolley running on a slanting cable. On exit the student falls about 8 feet in his risers before the slack is caught up, and he then rides the trolley down

Figure 2.—A student in the mock-up door.

to a sawdust pit. This is the phase that normally results in most of the eliminations from jump school. About 10 percent of each class drops out here, either from flat, frank refusal to jump, or from freezing in the door. The high percentage of jump refusals at this stage and the low percentage thereafter is strong support for the feeling that fear of parachute jumping is not predicated on chance of injury, but on the inherently disagreeable prospects of leaving a stable platform to fall, however safely, through space. The mock-up tower is not hazardous, but it certainly is frightening, and most jumpers will admit that an exit from it takes more intestinal fortitude than a real jump.

Another phase of preliminary training, also begun in the first week, is the instruction in the technic of the parachute landing fall which is designed to transmit the shock of landing straight to the body rather than to the feet alone. The student learns, by jumping from a low platform, quickly to rotate and bend his body in such a way that he contacts the ground in less than a second with each of the following anatomic locations: (1) the balls of the feet; (2) the lateral aspect of the calf; (3) the lateral aspect of the thigh; (4) the gluteal region; and (5) the dorsolateral thorax and scapular region. The final result, after much

Figure 3.—The student has just jumped from the 34-foot tower.

awkward practice, is a graceful maneuver almost too quick to follow, but a process which limits the shock on the feet and ankles to only 40 percent of the total load. The kids learn it from daddy when he gets home from jump school, and it is something to behold to watch a 3-year-old jump from the top of the spare tire of a jeep, roll over, and run back for more fun.

The last technic taught in the first week is that of collapsing the parachute on landing. Because a wind of 15 miles an hour will keep the parachute inflated and drag a jumper, specific instruction in the procedure of collapsing the parachute is necessary. Practical work is carried out with the aid of a wind machine (fig. 4).

In the second week the training in the mock-up, the mock-up tower, and parachute-landing falls progresses from individual performance to team performance. Eighteen-man "sticks" exit from the ground-bound mock-up with precision speed, and 4-man sticks jump from each door of the 34-foot mock-up tower. Parachute-landing fall practice progresses from a 2-foot to a 4-foot platform, and falls are made with full combat equipment.

Figure 4.—Using the wind machine, instruction is given in the control of the parachute after landing.

During this week two new phases are added. The first, carried out in what is affectionately dubbed the "Nutcracker Suite" (the designation is officially taboo) is the training in a suspended harness (fig. 5). Here the student learns how to control his parachute during descent, from the time of exit until landing. The other new item of the second week is the first parachute drop—from the top of the 250-foot tower (fig. 6). The student is rigged in a harness connected to a large (32-foot) specially constructed parachute, and he is hauled to the top of the tower and released. Each such free descent is an instructional exercise, guided by an instructor on the ground with a loud speaker, coaching and correcting the student on control of his parachute, and preparation for and execution of a proper landing. For most students the tower drops are sheer fun.

Finally comes the last week, the climax—a week of jumping (2). There is a painfully detailed fitting and checking of parachutes, and then 32 men are loaded into a C-82 which takes off for the drop zone which has been plowed and re-plowed, by much equipment and many human feet, until it is a square mile of ankle deep dust. Four minutes short of the field the red light goes on. *Get ready.* Your aircraft safety

(2) Officers stay afterwards for an anti-climatic fourth and fifth week of training in air transportability, jumpmastering, and heavy drop technic.

Figure 5.—Control of the parachute during descent is taught in the suspended-harness apparatus.

belt is unhooked; you hunch toward the edge of your seat, and arrange your static line over your left shoulder (for this jump), holding the fastener on the end in your right hand. *Stand up.* You do just that, but in a certain location, with your feet arranged in a specific manner. *Hook up.* You hook the snap fastener of the static line onto the quarter-inch steel cable which runs the length of the fuselage, just above your head. *Check your equipment.* Your own equipment in front, and the equipment on the back of the man ahead of you in line. *Sound off for equipment check.* "Number 32 OK," down the line in reverse numerical order, until there is heard "Number 1 OK," then *Stand in the door,* and *Go.*

The first jump is a series of individual exits. After each man takes a proper position in the door, the instructor in the airplane taps him and says "*Go.*" Subsequent training jumps include a mass jump from the right door, a mass jump from the left door, a full mass jump using both doors, and last a full mass jump with complete field equipment including M1 rifles.

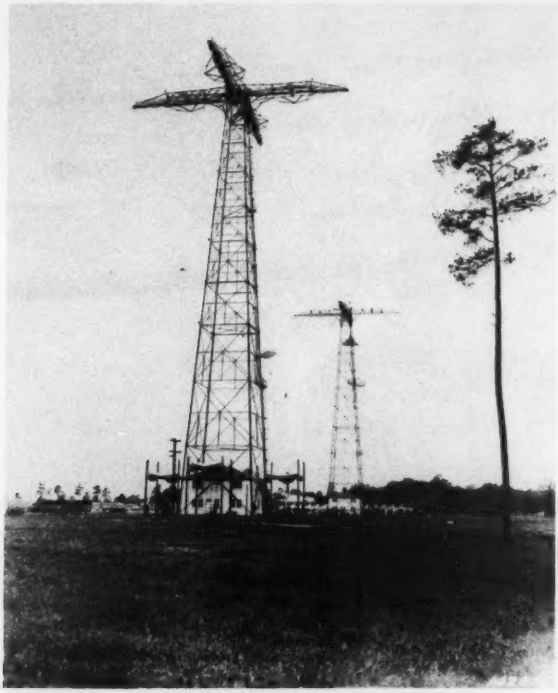


Figure 6.—Two students making descent from 250-foot free tower in the background. In the foreground is a controlled tower.

On the command *Go* you jump up and out. You pull your chin down near your sternum; grasp your reserve parachute, which is perched transversely across your epigastrium, with both hands, fingers spread, elbows adducted closely; and you bend forward slightly at the waist. You assume this position automatically now, and almost instantaneously. You begin counting on exit: "One thousand, two thousand, three thousand." Unless you are counting faster than you have been taught to count, you never reach three thousand—that count is lost in the grunt of a forced expiration brought on by the opening shock. On leaving the aircraft your static line, anchored by its fastener to the cable in the fuselage, pays out for its 15-foot length, then pulls out your main parachute from the back pack. That chute catches the air, then *wbam!* You *were* going 115 knots; *now* you are standing still. You begin your descent. From 1,000 feet, standard jumping altitude, the descent takes about 50 seconds. During that time you check your canopy to see that it has opened fully and is intact. You keep a sharp lookout for other jumpers—an entanglement is a greater hazard than a bad landing. As

you approach the ground you assume the landing position. The balls of your feet touch, then the other four points of contact in quick order. You roll over to look up and see how the others are making out. You think back over the course. Some of it was hard work, but it was worth it. Four more jumps and you will be an airborne soldier, and there's nothing like it!

Atelectasis Following Removal of Impacted Tooth

James L. E. Bock, *Major, U. S. A. F. (DC)* (1)

I. Louis Hoffman, *Lieutenant Colonel, U. S. A. F. (MC)* (1)

THIS case is reported not only because of the rarity of massive collapse of the lung following a dental extraction under local anesthesia, but also to stress the importance of efficient liaison between the medical and dental departments of a military hospital. Postoperative atelectasis, or massive collapse of the lung following major operations, is not an unusual occurrence. It occurs most frequently following abdominal operations performed under general anesthesia. There is, however, little or no mention of this condition in the dental literature.

A knowledge of the cause and the pathologic changes which occur in atelectasis is required for its early diagnosis and treatment in order to prevent the more serious complications of lung abscess, empyema, pneumonia, and bronchiectasis. Atelectasis is the condition which prevails when air cannot enter the lungs to replace that which is absorbed in the alveolar capillaries. It results in the partial or complete collapse of a lobule, lobe, or entire lung.

King (2) in 1933, reviewed a series of cases which he classified according to the anesthetic used and found pulmonary complications occurring in 12 percent following general anesthesia; 16 percent following spinal anesthesia; and 18 percent following local anesthesia. The greater incidence following local anesthesia was attributed to the fact that the patient voluntarily, because of discomfort, reduces his respiratory excursions and holds his cough reflex in check. Massive collapse is not common following tonsillectomy under local anesthesia. Dwyer (3) reported a case which was complicated by peripheral neuri-

(1) Reese Air Force Base, Lubbock, Tex.

(2) King: Quoted by Lee, W. E., and Farrell, H. L.: Massive collapse of the lung. Lewis' Practice of Surgery, Volume V. W. F. Prior Co., Inc., Hagerstown, Md., 1949. Chap. 4, p. 12.

(3) Dwyer, H. V.: Peripheral neuritis complicated by massive collapse of the lung following tonsillectomy. Arch. Int. Med. 46: 833-840, Nov. 1930.

tis. Iglauer (4) and Sawyer (5) each reported a case. In all three cases, no definite cause for atelectasis was established. Most authors believe that the primary causative factor of massive collapse of the lung is mechanical obstruction. The factors contributing to bronchial obstruction are: : (1) aspiration of mucus, blood and other material during and after operation; (2) increase in amount of thick mucus in respiratory tract by various antispasmodic, hypnotic, and sedative drugs; (3) upper respiratory infections; and (4) reduced cough reflex.

CASE REPORT

A 23-year-old man was admitted to the dental clinic on 8 September 1950 complaining of pain in lower left molar region, which had persisted for about a week and had grown steadily worse. A dental examination revealed inflammation of the soft tissues surrounding the lower left third molar with a slight exudation of pus. The second molar was acutely sensitive to percussion. Roentgenograms revealed a complete horizontal bone impaction of the lower left third molar impinging on the distal root of the second molar and involving the root canal. The patient was admitted to the hospital to clear up the infection, and for an oral operation. He had had pneumonia of the left lung in 1944 without complications or sequelas.

He was given 300,000 units of procaine penicillin in oil intramuscularly daily, and a capsule containing aspirin, phenacetin, caffeine, and codeine (0.03 gram) every 4 hours as needed for pain. The infected area was irrigated every hour with warm saline solutions. The patient was observed daily, and on 11 September the infection had subsided sufficiently to warrant the removal of the impacted tooth. The preoperative medication consisted of 0.1 gram of pentobarbital sodium, 15 mg. of morphine sulfate, and 0.5 mg. of atropine sulfate. The patient was operated on on 11 September at 1430 hours under a mandibular block using 2 percent procaine hydrochloride. A surgical flap was laid back and the horizontal impaction and second molar were removed. At 2000 hours moderate oozing from the wound was noted. A hemopack was applied to the wound, and 100 mg. each of vitamins C and K were given parenterally. At 2300 hours when the patient was seen by one of us the oozing had practically ceased. The patient slept soundly for the remainder of the night.

At 0800 hours the following morning, he complained of chest pain, tightness, and dyspnea. He was unable to sit up, felt weak, was frightened, and perspired profusely. A diagnosis of massive collapse of the major portion of the left lung was made immediately. The hemopack was

---

(4) Iglauer, S.: Massive pulmonary collapse following tonsillectomy under local anesthesia; case report. Tr. Am. Laryng., Rhin. & Otol. Soc. 42: 25-34, 1936; also, Pulmonary collapse following tonsillectomy under local anesthesia; report of case. Arch. Otolaryng. 25: 382-388, Apr. 1937.

(5) Sawyer, L. L.: Massive atelectasis following tonsillectomy under local anesthesia; report of case. Arch. Otolaryng. 46: 45-51, July 1947.

removed and a roentgenogram of the chest was ordered. Meanwhile, respiratory distress increased, the patient was placed in an oxygen tent and postural drainage was instituted. The roentgenogram confirmed massive collapse of lower two-thirds of the left lung with the heart, trachea, and mediastinum displaced to the left. The respiration was rapid and labored, the pulse was rapid and thready, and the temperature was 101° F. The patient was moderately cyanotic. His condition was critical. Arrangements were immediately made for a bronchoscopy. A suppository containing 0.2 gram of monosodium barbiturate and 1 gram of aureomycin were given prior to bronchoscopy. A large amount of thick mucopurulent secretion and some blood clots were aspirated. When the aspiration was half completed, the left lung could be seen to begin to expand. On completion of the bronchoscopy, the patient felt better and was able to sit up. A postbronchoscopic roentgenogram revealed almost complete aeration of the left lung with a return to normal position of the trachea, heart, and mediastinum. The left diaphragm was still higher than the right.

The patient was replaced in the oxygen tent. Cough and postural drainage 10 minutes out of every hour was encouraged. A total of 4 grams of aureomycin and 900,000 units of procaine penicillin were given daily. The patient was removed from the oxygen tent after 4 hours. On 13 September, he was comfortable. The temperature, pulse, and respiration were normal. A roentgenogram of the chest taken on 14 September showed complete aeration of left lung. The left diaphragm was still elevated. There were no signs of pneumonitis. Aureomycin and penicillin were continued until 18 September and a final roentgenogram of the chest was taken which showed no significant abnormalities. The patient was discharged to light duty on 21 September and resumed his regular duties 1 week later.

DISCUSSION

Reviewing the causative factors of pulmonary collapse, one would hardly expect such a complication following a relatively simple dental extraction under local anesthesia. This patient had no apparent allergy. The premedication with morphine, atrophine, and pentobarbital sodium was considered optimal. During the surgical removal of the teeth, the patient seemed to be uncomfortable and a little anxious. The extractions were performed with the patient sitting. For complicated impactions patients are usually operated on in a horizontal position with the head down, but this was not considered a difficult case, and the extractions were performed easily.

According to Jermain *(6)* and other writers, atelectasis occurs usually from 24 to 72 hours postoperatively. The onset in this case occurred about 14 hours after operation. The patient received only one capsule for pain a few hours after the extractions were performed. An aspirator was used throughout the operation and adequate suction was

(6) Jermain, W. M.: Diseases of the Lung. In Tice, F.: Practice of Medicine, Volume V. W. F. Prior Co., Inc., Hagerstown, Md., 1949. p. 565a.

obtained. At no time was the gag and swallowing reflex abolished. The amount of postoperative bleeding was slight. The cause of atelectasis in this case was the aspiration of blood and mucus as shown by the bronchoscopy. Because the cough and gag reflex was not abolished during the operation, and because efficient suction was maintained throughout, it is felt that the aspiration did not take place at that time, but because there may have been slight oozing of blood from the wound while the patient was sleeping soundly, it is believed that the aspiration took place then. It is possible that fear, apprehension, and discomfort may have restricted the gag and cough reflex during the operation. Also, the upright position of the patient would influence the gravitation of blood and mucus to the region of the larynx.

CONCLUSIONS

This case illustrates that serious complications can arise from a comparatively simple dental operative procedure. Massive collapse of the lung is relatively uncommon as a postoperative complication but must be considered in the practice of dentistry. The following measures are suggested in the hope of preventing such an occurrence:

1. Avoid any dental extractions or oral operations if there is any evidence of local oral sepsis or upper respiratory infection.
2. Avoid overusage of premedication and postoperative medication with drugs which tend to depress the cough or gag reflex thereby hindering the patient from expectorating mucus, blood, and/or other material.
3. Give sufficient premedication to relax the patient so that fear and discomfort will be markedly lessened.
4. Obtain a complete blood count, including bleeding and clotting time, preoperatively.
5. The operator should strive for as complete hemostasis as possible and the patient should be seen frequently if there is oozing.
6. Excessive sedation and hypnosis should be avoided if oozing is present.
7. Encourage cough and postural drainage at specified times following oral operations in which the patient has been heavily premedicated.
8. Perform extensive oral operations with the patient in a horizontal position with the head down in order to prevent mucus and blood from gravitating into the lungs.
9. Maintain the patient in a prone position with the head lower than the body for from 12 to 24 hours following operation to promote drainage from the mouth.
10. Encourage early ambulation.
11. Use adequate suction continuously during all oral operations.
12. Use chemotherapy, both preoperatively and postoperatively, if there is any evidence of recent dental or upper respiratory infection.

When symptoms of atelectasis or the suspicion thereof arise following a dental operation, consultation with a physician should be had immediately. If possible bronchoscopic suction of the aspirated material from the bronchi should be performed without delay in order to relieve the symptoms and prevent serious complications.

957408 O - 51 - 4

Focal Attack in Tuberculosis Control

Sidney A. Britten, *Commander, MC, U. S. N. (1)*

Wilbur V. Charter, *DPH, (2)*

THE purpose of this study is to review and analyze the morbidity data relating to tuberculosis among naval personnel in order to see if guides are available for the planning of supplementary aids to the more general preventive measures now in effect. Although the Navy has a rigidly controlled population, it is difficult specifically to measure the hazard of that population with respect to tuberculosis. In the first place naval personnel have many contacts with civilians as well as working relationships with individuals in the service. Furthermore, many continue living with the family unit while others are separated entirely from a household environment. Another variable difficult to evaluate is the problem of measuring the effect exerted by turn-over of personnel. Recently it has been shown that from 85 to 90 percent of the recruits react negatively to an intradermal test with 0.0001 mg. of purified protein derivative of tuberculin *(3)*. This is a higher percentage than is found for other naval personnel. It is probable, therefore, that the current increase in strength will result in an increase in the ratio of those having negative tuberculin tests.

Smiley and Raskin *(4)* in their review of tuberculosis in the Navy pointed out the consistent decline in the incidence of tuberculosis since 1900 and envisaged the time when this condition would be entirely eradicated. The forces exerted by the wartime mobilization, however, interrupted the favorable decline in rates. Today, it would appear that the standard of perfection predicted by them will not be reached in the foreseeable future.

The Navy carefully screens all applicants and maintains constant vigilance for early symptoms and signs of illness. In addition, de-

(1) Preventive Medicine Division, Bureau of Medicine and Surgery, Department of the Navy.

(2) Medical Statistics Division, Bureau of Medicine and Surgery, Department of the Navy.

(3) Canada, R. O., and Babione, R. W.: Tuberculin testing of midshipmen and recruits of Navy and Marine Corps. U. S. Armed Forces M. J. 1: 971-978, Sept. 1950.

(4) Smiley, D. F., and Raskin, H. A.: Tuberculosis as Navy problem. Dis. of Chest 10: 210-233, May–June 1944.

tailed programs of sanitation and hygiene, careful examination and supervision of contracts, and annual roentgenographic examinations are all basic elements of the general preventive program. In spite of all these safeguards, however, the crowding of personnel aboard combat vessels, together with assignments to certain foreign areas, introduces additional risks to naval personnel. In spite of all possible preventive measures it appears that certain factors will continue and tuberculosis will remain a problem in the Navy that will demand constant vigilance on the part of the Medical Department.

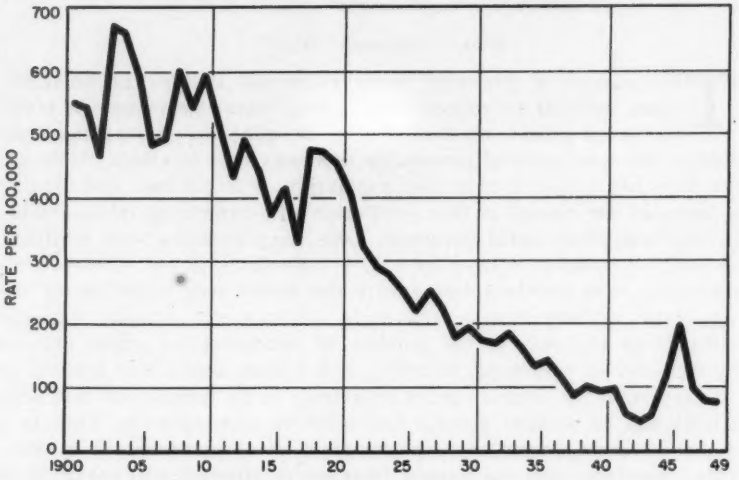


Figure 1.—Original admission rates for tuberculosis, all forms, U. S. Navy, 1900–1949.

In compiling morbidity statistics in the Navy the basic consideration is the incidence of a condition and not the number of persons involved. Individuals on the sick list are carried under only one diagnosis at a time—the one which the attending medical officer considers to be the major cause for hospitalization. A change in diagnosis is reported when, in the opinion of the medical officer, another diagnosis warrants recording. Although this system quite accurately records incidence of any condition with the related sick days, it will show a difference between incidence and number of persons because any one person might be changed from one tuberculosis diagnosis to another during any year. This procedure is especially important in tuberculosis reporting because changes of activity as well as changes in extent (minimal, moderately advanced, and far advanced) would be recorded as other incidence of tuberculosis. With the exception of figure 1, all data presented in this article are based on incidence which may be considered as from 20 to 25 percent greater than the actual number of persons involved.

The rates for tuberculosis, all forms, continued to decline through the year 1944. The incidence rate was slightly over 1 per 1,000 in 1943 and then receded in 1944 to 0.8 per 1,000. This is the lowest rate ever recorded for naval personnel. In 1945 the incidence rate was twice that for 1944 and increased again in 1946 during demobilization to 3 per 1,000 average strength. Subsequently, the rate decreased rapidly and by 1948 had again reached a level comparable to that of 1943 (table 1). Many variables influence the forces of morbidity in controlled populations, and these factors become of paramount importance when attempting to analyze tuberculosis rates. Because this disease is insidious in character, the annual rates are greatly influenced by the case-finding programs in use during the period under consideration. For instance, the routine chest x-ray case-finding program had a marked effect in producing changes during the years included in this study. From 1941 to the middle of 1944, routine roentgenograms or photofluorograms of the chest were made only of recruits and reserve personnel as they came on active duty (*5*, *6*). After June 1944, however, the chest x-ray program was gradually expanded to include a chest roentgenogram or photofluorogram of all personnel as part of the physical examination made when entering service, at annual intervals while on active service when practicable, and as part of the physical examination made during separation from the service. This intensified program tended to produce higher rates among recruits in the period prior to June 1944 and among all personnel subsequent to that time, at least until the Navy had undergone as complete a screening as was approached during demobilization.

TABLE 1.—*Incidence and incidence rates for tuberculosis, all forms, U. S. Navy, 1943–1948*

Year	Incidence	Incidence rate per 1,000
1943	2,489	1.2
1944	2,662	0.8
1945	5,832	1.6
1946	4,016	3.0
1947	1,061	1.8
1948	566	1.1

When the incidence rates are inspected separately for men and women, some apparent differences appear that need closer examination (table 2). Although the rates for women were consistently higher than those for men, a reduction in the number of cases in women would have had little effect on the incidence of tuberculosis in the Navy as a whole. Nevertheless, it seems pertinent to attempt to pinpoint the

(*5*) Behrens, C. F., and Britten, S. A.: Five years of photofluorography in the Navy. U. S. Nav. M. Bull. 45: 1203-1207, Dec. 1945.

(*6*) Shapiro, R.: Pulmonary tuberculosis in Navy recruits; review of 50,100 photofluorographic chest examinations. Am. Rev. Tuberc. 49: 485-489, June 1944.

TABLE 2.—*Incidence and incidence rates by sex for tuberculosis, all forms, U. S. Navy, 1943–1948*

Year	Incidence		Incidence rate per 1,000	
	Men	Women	Men	Women
1943	2,334	148	1.1	4.3
1944	2,517	142	0.8	1.6
1945	5,693	139	1.6	1.3
1946	3,883	124	3.0	4.4
1947	1,038	20	1.8	3.5
1948	549	14	1.1	3.2

problem more closely within each sex group. Among the men there appears to be only slight differences between the officers, Navy enlisted, and enlisted personnel of the Marine Corps. Of the three groups, the lowest rates were recorded for the Marine Corps enlisted group and the highest for enlisted personnel of the Navy with the officers between the two (table 3). The reasons for these consistent differences, even though small in magnitude, are difficult to explain.

TABLE 3.—*Incidence and incidence rates by type of male personnel for tuberculosis, all forms, U. S. Navy, 1943–1948*

Year	Incidence			Incidence rate per 1,000		
	Officers	Enlisted personnel		Officers	Enlisted personnel	
		Navy	Marine Corps		Navy	Marine Corps
1943	197	1,851	286	0.8	1.2	1.0
1944	259	2,040	218	0.8	0.8	0.5
1945	615	4,604	474	1.7	1.6	1.2
1946	438	3,010	439	2.9	3.0	2.9
1947	86	846	106	1.5	2.0	1.2
1948	45	464	40	0.9	1.2	0.5

Among the women one of the significant findings, even though some variation was expected, was the higher rates noted for the Nurse Corps. Caution should be taken in interpreting these rates, however, because such small numbers are involved and one or two cases in any one year will greatly influence the rates. During the period under discussion the rates for the Nurse Corps were consistently higher than for either the enlisted group or the other officers (table 4). It is of special interest that the rate for nurses was higher than for the other female officers because the two groups probably were fairly comparable in age and pre-nurse-training environmental background. The female enlisted group had rates that were higher than the rates for enlisted men. This was true even though there were practically no female personnel more than 40 years of age. This is an important considera-

tion because tuberculosis rates in the Navy increased with age, as shown in figure 2.

TABLE 4.—*Incidence and incidence rates by type of female personnel for tuberculosis, all forms, U. S. Navy, 1943–1948*

Year	Incidence			Incidence rate per 1,000		
	Officers	Nurses	Enlisted personnel	Officers	Nurses	Enlisted personnel
1943	1	10	137	0.2	1.9	5.7
1944	9	16	117	1.0	1.9	1.6
1945	11	36	92	1.2	3.5	1.1
1946	9	35	80	2.8	6.5	4.0
1947	–	9	11	0	4.3	3.8
1948	2	8	4	4.2	4.0	2.1

After reviewing the age specific rates, the question arises as to whether the increase in the rates was related only to age or whether the rates were affected by the continued exposure to environmental factors related to naval service. The period being considered in this report was a very abnormal interval for the two variables, age and length of service. Large numbers of older persons were suddenly brought into the service and the impact of this group on the tuberculosis rates is difficult to ascertain. As an example, nearly 20 percent of the incidence of tuberculosis for the years 1945 to 1948 was contributed by persons over 24 years of age with less than 3 years'

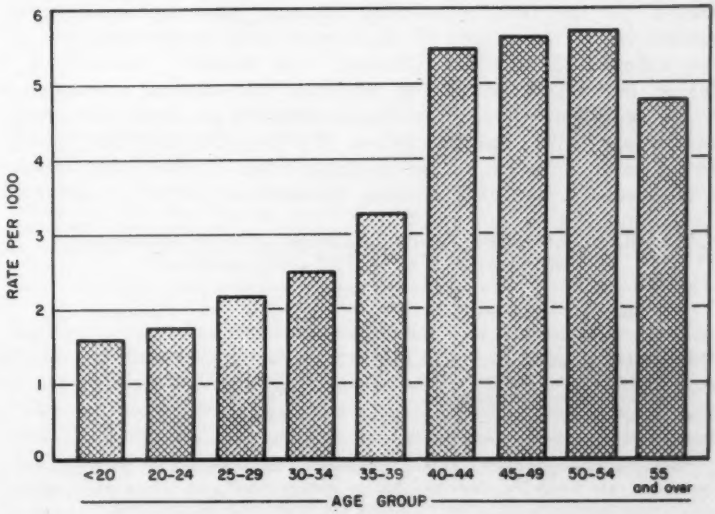


Figure 2.—Incidence rates by age group for tuberculosis, all forms, U. S. Navy, 1945–1948.

service. Unfortunately, population bases for the entire period are not available for age broken down by length of service.

TABLE 5.—*Incidence and incidence rates by specified type of enlisted personnel for tuberculosis, all forms, U. S. Navy, 1943–1948 combined*

Type of personnel	Incidence	Incidence rate per 1,000
Marine Corps enlisted	1,523	1.1
Navy enlisted:		
Aviation	771	1.2
Seamen	5,477	1.2
Artificers*	3,343	1.7
Hospital corpsmen	714	2.2
All other	2,024	2.1

*Includes specialties which in civil life would be known as crafts or trades, such as painters, carpenters, machinists, et cetera.

In attempting to pinpoint as closely as possible the focal point of tuberculosis in the Navy, it seemed advisable to attempt to separate the Navy enlisted into categories according to specialist ratings. As was mentioned previously, Marine Corps personnel have lower rates than the Navy enlisted group, as shown in table 5. In fact the rates are lower than for any of the specialty groups of the Navy. Of the specialty groups, the highest rates were noted for artificers and hospital corpsmen. Although the rate for the "all other" classification is the second highest, this group is so heterogeneous in composition that little direct information is gained from the computation. In the case of hospital corpsmen there is no knowledge available as to the number of them contracting tuberculosis who had been exposed through direct contact with patients. Another bit of missing information relating to artificers and hospital corpsmen is an age breakdown of the individuals included in these two groups. Because age is an important factor, it is possible that this variable exerted some influence on the observed rates. Further study relating to tuberculosis, especially among hospital corpsmen, is indicated.

TABLE 6.—*Incidence by activity classification for tuberculosis, all forms, U. S. Navy, 1943–1948 combined*

Diagnosis classification	Incidence	Percent of total
Tuberculosis, all forms	16,627	100
Pulmonary, chronic, active	8,797	53
Pulmonary, chronic, arrested	5,764	35
All other*	2,066	12

*Includes extrapulmonary, miliary, pneumonic, tracheobronchial, pleuritic, and pulmonary not otherwise classified for the entire period and 657 cases of tuberculosis, primary, apparently healed, during the years 1945–48 combined.

By diagnosis.—For the period 1943 through 1948, the incidence was subdivided by classification of combined diagnoses as shown in table 6. Active chronic pulmonary tuberculosis accounted for 53 percent of the total. About three-quarters of the patients classified as "all other" had active tuberculosis, the remainder having pulmonary calcifications.

In considering pulmonary tuberculosis separately, data for the combined years 1945 through 1948 only are included. A change in the nomenclature in 1945 broke the individual diagnostic continuity; therefore, pulmonary tuberculosis is considered separately for the period 1945 through 1948 as shown in table 7. Fifty-nine percent of the total incidence was active and 35 percent arrested. The effect of x-ray case finding is clearly evident. It is probable that most of the minimal cases were discovered by routine roentgenograms of the chest. At admission, 46 percent were minimal in extent, a proportion reflected in mass x-ray surveys of the general population, but when clinical study was completed, the "clinically significant" proportion had been reduced to 19 percent of the total. Because many persons were returned to duty after clinical study with such diagnoses as arrested minimal tuberculosis (without bacteriologic confirmation or evidence of prior active disease) or pulmonary infiltration, cause undetermined, the responsibility for the continued supervision of their future health is a heavy one.

TABLE 7.—*Incidence of pulmonary tuberculosis, U. S. Navy, 1945–1948 combined*

Diagnosis	Incidence	Percent of total
Total	10,910	100
Pulmonary, primary, active	181	2
Pulmonary, primary, apparently healed	657	6
Pulmonary, reinfection, active, minimal	2,063	19
Pulmonary, reinfection, active, moderately advanced	2,983	27
Pulmonary, reinfection, active, far advanced	1,190	11
Pulmonary, reinfection, arrested, minimal	2,994	27
Pulmonary, reinfection, arrested, moderately advanced	785	7
Pulmonary, reinfection, arrested, far advanced	57	1

SUMMARY

The incidence rates for the period under study represent an interruption of the downward trend for tuberculosis, all forms, since 1900. The interruption came during a period of war and is not unexpected in view of the increase in tuberculosis mortality and morbidity reported by others for this country and elsewhere (7–9). Complicating

(7) Edwards, H. R., and Drolet, G. J.: Implications of changing morbidity and mortality rates from tuberculosis. Am. Rev. Tuberc. 61: 39-50, Jan. 1950.

(8) Sartwell, P. E.; Moseley, C. H.; and Long, E. R.: Tuberculosis in German population, United States Zone of Germany. Am. Rev. Tuberc. 59: 481-493, May 1949.

(9) McDougall, J. B.: Tuberculosis in England During the War. Am. Rev. Tuberc. 46: 677-683, Dec. 1944.

the interpretation of this phenomenon is the added factor of routine mass roentgenographic examinations of the chest which were begun in 1941 and reached maximum efficiency in 1945. That the interruption in the downward trend is temporary may be suspected by the rapidity with which the trend line has approached the prewar level. It is too early, as yet, to determine what effect, if any, the x-ray case-finding program may have on accelerating the downward trend in incidence rates.

That marked differences in incidence according to age, sex, occupation, and length of service were evident during the period of study has been clearly shown. Women had higher rates than men. Nurses had the highest rates of all. Rates generally increase with increasing age, and this fact may be expected to cause a rise in incidence rates in the early years of service during periods of mobilization when men of the older age groups are accepted for enlistment in large numbers.

Minimal shadows in the chest roentgenogram appear to be important *(10–12)*. More than one-half of the persons referred for clinical study of such shadows were found to have arrested lesions of tuberculosis or pulmonary fibrosis of undetermined cause. Assuming that a large proportion of them are returned to duty, a potential reservoir of pulmonary disease is created.

The use of incidence relating to tuberculosis, although providing important information, results in a certain amount of bias when compared to the number of persons involved. The course of tuberculosis and the changes in diagnosis due to activity, extent of involvement, or complications make the incidence rates higher than would be the case if patients, rather than diagnoses, were recorded.

CONCLUSIONS

The incidence rates for tuberculosis, all forms, and its subdivisions have proved to be useful in exposing certain differences in respect to sex, age, occupation, and length of service which indicate that the distribution of cases of tuberculosis has not been random among naval personnel during the period 1943 through 1948. These differences should be explored in order to define, if possible, the sources of dissemination of the tubercle bacillus and the causes of reduction in host resistance to invasion. This is important in view of the high proportion of recruits entering service without evidence of prior infection.

---

(10) Silverman, C.: Appraisal of contribution of mass radiography in discovery of pulmonary tuberculosis. Am. Rev. Tuberc. 60: 466-481, Oct. 1949.

(11) Fellows, H. H.; Evans, J. A.; and Stephens, M. G.: Disposition and follow-up of pulmonary tuberculosis; study based on character and extent of lesion seen on initial roentgenogram. Am. Rev. Tuberc. 60: 487-500, Oct. 1949.

(12) Reisner, D., and Downes, J.: Minimal tuberculous lesions of lung; their clinical significance. Am. Rev. Tuberc. 51: 393-412, May 1945.

The differences suggest further investigation to find answers to such questions as: (1) Where did personnel admitted for tuberculosis acquire the infection; were they infected prior to entering the service or did they acquire the infection after entering the service? (2) What personnel in the groups characterized as "artificer," "hospital corpsmen," and "all other" account for the higher incidence rates within those groups? (3) Is the high rate among nurses caused by infection acquired during training or during the performance of their naval duties? Because it appears unlikely that these questions may be answered by analyses of rates, a study of the individual case records of persons admitted for tuberculosis has been initiated.

A particular point of immediate interest emerging from this investigation is that attack rates increase with advancing age. Persons over 30 years old must be included in all x-ray surveys, and those with productive cough examined promptly lest they become the unsuspecting disseminators of the tubercle bacillus among the younger men in their charge, 90 percent of whom when recruited react negatively to a tuberculin test. In addition, particular attention to the possibility of tuberculosis should be paid in examination of older personnel entering active naval service in time of mobilization.

Another important point which must be kept constantly in mind is the necessity for continuous supervision of naval personnel with pulmonary defects, causes of which have not been determined.

Repair of Antro-Oral Fistula

Report of Case

Richard J. Burch, *Lieutenant Colonel, U. S. A. F. (DC)* (1)

ON 26 November 1949 a 22-year-old soldier was admitted to the oral surgery service of Percy Jones Army Hospital from overseas with the transfer diagnosis of antro-oral fistula of the right maxilla. In March 1949 his right maxillary first molar had been removed with difficulty. Following this procedure the opening into the sinus at the site of the removed molar failed to close. Four unsuccessful attempts to close the fistulous opening surgically were made between March and November. The patient had suffered from moderately severe headaches and a sensation of fullness of the right side of the face. He was unable to play the trumphet in the band, which was his military duty.

Examination revealed a well-developed, well-nourished man with a chronic right maxillary antro-oral fistula (fig.1) discharging a foul exudate. The tract occupied the area of the first molar socket. The opening into the maxillary sinus had a diameter of about 1 cm. Chronic inflammation of the regional soft tissue and sequestration and necrosis of the bone were observed. Complete roentgenographic examination revealed a clouding of the right maxillary sinus (fig.2) and no evidence of a foreign body within the sinus. There was a marked difference in the transillumination of the right and left maxillary sinuses.

The sinus was irrigated daily with normal saline solution through the fistulous opening and the tract was curetted under local anesthesia to remove the sequestrums. A full maxillary impression and model were made. The model was relieved to provide for postoperative swelling in the area of the contemplated operation and duplicated. A full palatal acrylic splint with retention clasps (fig.3) was then constructed on this model and inserted to maintain an iodoform gauze dressing in the tract to close communication between the maxillary sinus and the mouth. Daily irrigations were continued, followed by the instillation of 200,000 units of penicillin in 5 cc. of normal saline solution and dressing. After 10 days the headaches

(1) Chanute Air Force Base, Ill.

Figure 1.—Antro-oral fistula is seen at site of dental extraction. Figure 2.—Roentgenogram showing clouding of the maxillary sinus.

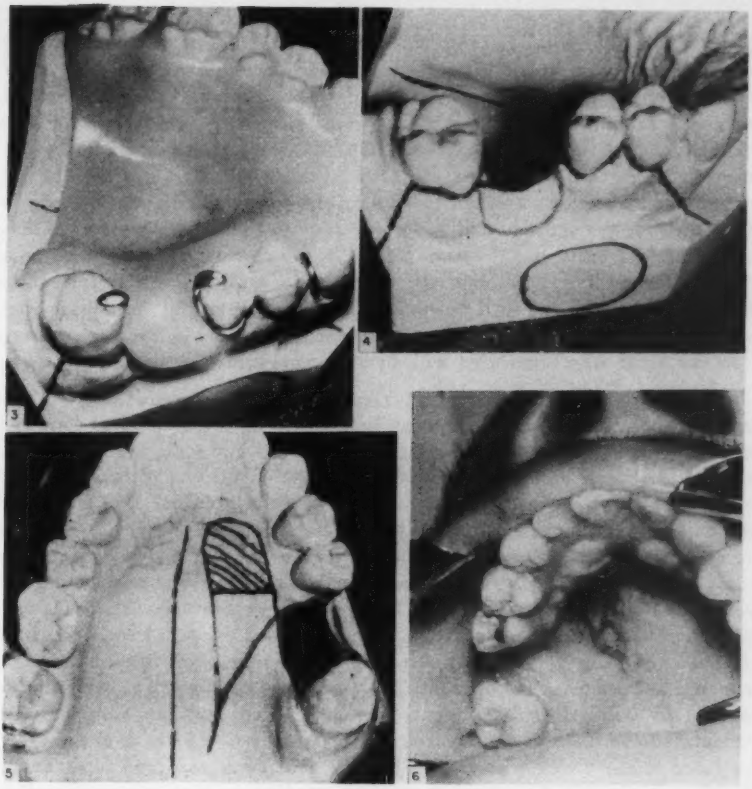


Figure 3.—Full palatal acrylic splint. Figure 4.—Representation on model of operative procedure. Figure 5.—Representation on model of operative procedure. Figure 6.—Wound almost completely healed.

stopped and the appearance of the tissues of the tract improved. Irrigation, penicillin instillation into the sinus, and dressing were repeated 3 times a week for 4 weeks. The patient was then considered ready for operation.

On 24 January 1950 a Caldwell-Luc radical antrostomy, nasal antrotomy, and plastic closure of the fistula by turning a palatal flap, were performed under gas-oxygen-ether left nasal intratracheal anesthesia. A low laryngeal pack was placed around the Magill tube with 20 inches of 2-inch damp gauze by means of a Magill forceps. Following routine draping a small rubber catheter was then passed through the right nares into the oropharynx and brought out through the mouth. A No. 8 silk ligature fastened at one end around a small synthetic sponge was then fixed to the catheter and the silk returned through the mouth and nares and the sponge

pulled into the right nasopharynx to block the opening and control hemorrhage. The silk control ligature was fixed to the draping. The oropharynx was further packed from the mouth with gauze sponges. An elliptical incision was begun in the mucobuccal fold distal to the second molar, carried downward and anteriorly along the gingival margin to course upward into the mucobuccal fold anterior to the cuspid. Entry into the maxillary sinus through the canine fossa was made with mallet and chisel and enlarged with rongeurs (fig. 4). The sinus was filled with polypoid tissue, which was completely removed, and a portion sent to the laboratory for pathologic examination. A nasal opening into the sinus was made by passing a curved Kelly forceps through the right nares and pushing it forcefully through the antronasal wall below the inferior concha. This opening was enlarged with the rongeurs through the canine fossa window. Hemorrhage from the sinus was controlled with hydrogen peroxide packs.

All tissue was removed from the fistulous tract; the antral and oral origins of the tract and the bone were lightly curetted. The palatal flap was incised, leaving a proximal pedicle, and the flap including the periosteum elevated. All epithelium was removed from the distal end of the flap for 1 cm. (fig. 5). The flap was then turned into position to close the defect and the denuded end tucked under tne buccal flap and secured with a mattress suture of 000 silk. The buccal flap was then sutured and additional sutures placed on the palatal surface for maintenance of the transposed tissue. The donor site on the palate was dressed separately with gauze saturated in petrolatum and iodoform. The area over the repair was likewise dressed and the acrylic splint placed. The nares and throat were inspected and suction was applied. The postnasal pack was removed and replaced by a small gauze nasal dressing pulled into position from the throat and the ends of the control silk ligature passed out of the nares to be fixed to the cheek with tape. The laryngeal pack was then removed and suction was applied to the larynx. The Magill tube was removed and the patient was taken to the recovery room.

The patient withstood the operation well and his blood loss was minimal. Routine postoperative care, including penicillin therapy, was given. The maxillary sinus was irrigated with 50 cc. of warm saline solution through the nasal opening on the second postoperative day and twice weekly thereafter for 2 weeks. On the fifth day the dressing splint and sutures were removed and the area redressed. The dressing in the donor site was not disturbed until 10 February, and at that time the area was almost entirely covered with fibroid tissue epithelizing at the periphery (fig. 6). With the healing of the donor area 2 weeks later the patient was discharged.

Comment.—In the management of this problem in oral surgery the following points are emphasized: (1) light pressure on the tissue used to close an antro-oral fistula is desirable; (2) failure of closure of an antro-

oral fistula is largely caused by inadequate preparation and secondary chronic sinusitis; and (3) when secondary chronic sinusitis is present, closure is exceedingly difficult in the absence of radical antrostomy at the time of attempted closure and intranasal antrotomy for postoperative irrigation and drainage of the maxillary sinus.

957406 O - 51 - 5

The Treatment of Urinary Tract Infection

James C. Kimbrough, *Colonel, MC, U. S. A.* (1)

INFECTION is the most common disease condition of the urinary tract. For the purpose of treatment it is convenient to consider these infections in two classes: acute and chronic. The acute manifestations are acute pyelonephritis, cystitis, prostatitis, and vesiculitis. (Perinephric infections, gonorrhea, nonspecific urethritis, and tuberculosis of the genitourinary tract require extensive individual discussion and will not be considered in this article.) Chronic infections include chronic pyelonephritis, infected hydronephrosis, pyonephrosis, chronic cystitis, prostatovesiculitis, and urethritis. Infection is rarely confined to the bladder more than a few days and soon extends to the kidneys. The diagnosis of pyelitis is obsolete as a disease entity because the renal tubules are rapidly invaded and this diagnosis has been replaced by the term pyelonephritis.

ACUTE INFECTIONS

Pyelonephritis and cystitis (pyelocystitis) is the commonest type of acute urinary tract infection. This disease is manifested by frequent, urgent, and painful urination, chills, fever, and lumbar pain; gross hematuria may be present. It is often necessary to relieve the symptoms before the results of the urologic examination are ascertained.

Method of management

1. Rest in bed.

2. Catheterization of the bladder for specimen for microscopic examination and culture. Much information is gained early by making gram stains from centrifuged specimen.

3. Excretory urogram.

4. General medication for relief of symptoms.

---

(1) Walter Reed Army Hospital, Washington, D. C.

5. Specific medication consisting of 1 gram of sulfadiazine every 6 hours the first day and 0.5 gram every 6 hours after the first day; 300,000 units of an aqueous solution of penicillin every 6 hours the first day, followed by 300,000 units of procaine penicillin daily. Usually less than 5 days of this therapy will relieve the acute symptoms. Combinations of the sulfonamides may be of greater value than single drug therapy. The urine should be alkalinized when sulfonamides are given, in order to minimize the risk of renal damage. Chloramphenicol, aureomycin, and terramycin give excellent therapeutic results, but it is considered sound therapy to begin with the sulfonamides and penicillin and reserve the other agents until the causative organism is ascertained. It is not necessary to use the expensive antibiotics for cases in which the less expensive drugs give equally satisfactory relief.

Adequate fluid intake should be maintained. It is desirable to give 3,000 cc. daily, orally or parenterally. This will establish an output of about 1,200 cc. of urine unless there is excessive fluid loss by vomiting or perspiration. It has been advised that the fluid intake be limited when urinary antiseptics are administered in order to increase the urinary concentration of the active agent. It is believed, however, that the generally beneficial effect of a high fluid intake and the lavage effect on the urinary tract more than balance the decreased concentration of the antiseptics. In treating urinary tract infections, adequate drainage is of paramount importance. The protective forces of nature may be a more powerful aid to recovery than the therapeutic effects of drugs and antibiotics.

CHRONIC INFECTIONS

With the exception of tuberculosis, the normal urinary tract does not harbor infection for a long period. Recurrence or chronicity is usually caused by obstruction, calculus, or endocervicitis. It is imperative that a complete urologic examination be made in every case of chronic or recurrent infection and the necessary procedures, surgical or otherwise, be performed to correct obstructions, to remove calculi, or to eliminate other associated and contributing pathologic conditions. Infection is difficult to eradicate in the presence of urinary stasis and even if cleared the relief is only temporary and recurrence takes place. Chronic infections may follow acute attacks or the onset may be insidious and the disease process noted only after much damage has been done. Urinary antiseptics administered orally or parenterally become effective by urinary excretion and will have little effect in the presence of severe renal damage.

Procedure in treatment of chronic infections

1. Complete general and urologic examination, including a search for foci of infection.

2. Repeated urine cultures to ascertain the type and sensitivity of the infective agent. Not infrequently more than one organism is present.

3. Adequate general care and proper fluid intake.

4. Selection of the specific therapeutic agent for the bacteria present. Test the causative organism for sensitivity to the therapeutic agents available and make the proper selection. Bacteria become resistant to some drugs and antibiotics in a short time, therefore it is necessary to make frequent sensitivity tests and change the therapeutic agent as indicated.

5. Correct associated pathologic conditions such as obstruction, diverticulums, calculi, or endocervicitis.

Bacteria present.—*Escherichia coli* is the most frequent invader and the least difficult to eradicate; *Staphylococcus aureus* is next in frequency; *Aerobacter aerogenes* probably takes third place; and *Pseudomonas* and *Proteus* occupy fourth and fifth places. *Streptococcus hemolyticus* occurs rarely. Diphtheroids, *Micrococcus tetragenus*, and *Str. faecalis* are frequently found mixed with the other bacteria. *Pseudomonas* and *Proteus* often occur when patients have calculi, or in patients with drainage tubes. They are urea splitters and difficult to destroy. *Staph. aureus* may be a urea splitter and resistant to treatment.

THERAPEUTIC AGENTS

Sulfonamides are the most frequent agents used in combating urinary tract infection. They are nephrotoxic, causing tubular damage and urinary obstruction if the crystals block the tubules and ureters. Their administration should be accompanied by adequate fluid intake and alkalinization of the urine. There are a few cases of allergic reaction causing lower nephron nephrosis. At this hospital, since the beginning of this therapy, no serious consequences have been observed in patients treated in the hospital. This record has been maintained because alkalinization and fluid intake have been emphasized. Sulfadiazine is a safe agent. It is slowly absorbed and gives good urinary concentration. It is claimed to be dangerous because of its nephrotoxic reaction. Sulfathiazole is rapidly absorbed and gives excellent urinary concentration but is associated with gastrointestinal reactions.

Splendid results have been claimed for combinations of the sulfonamides—sulfathiazole, sulfadiazine, sulfamerazine, sulfisoxasole, and sulfacetamide. It is claimed that they have a synergistic action, but this has not been proved definitely and their action may be a mere summation of effect. The sulfonamides are effective in treating almost all forms of urinary tract infection, but have some disadvantages. It may be that they cause tubular damage late after their use. It is advisable to limit the administration to from 10 to 14 days, and to make sure of alkalinization and adequate fluid intake. Sulfonamides have been relegated to the background by the new "wonder drugs," but are still safe and economical agents in the treatment of urinary tract infection. A few cents' worth of sulfonamides may accomplish results equal to those obtained with several dollars' worth of antibiotics. The dosage is 0.5

to 1 gram every 6 hours depending on the severity of the symptoms and the stage of the disease. Daily estimation of blood levels is requested only in special cases. Bacteria do not acquire early resistance to sulfonamides, which is an advantage over the rapid resistance attained in the case of antibiotics.

Pulaski has combined sulfadiazine, penicillin, and streptomycin for intravenous use, with what appears to be a synergistic effect far beyond the supplementary action.

Antibiotics.—Penicillin is the most effective antibiotic in treating staphylococcus and streptococcus infections of the genitourinary tract. It is not effective against the most common invader, *E. coli,* but combined with sulfonamides, it makes a good "shotgun" treatment when complete examination is not practicable. It is not effective against *Pseudomonas, Proteus,* or *A. aerogenes.* It is eliminated rapidly in the urine, and in severe infections 300,000 units should be given intramuscularly in aqueous solution every 6 hours. Later in the course of the disease procaine penicillin, which is slowly absorbed, can be given once daily. Penicillin is effective in a wide pH range but is more potent in acid urine. Toxic reactions are rare but occasionally troublesome allergic dermatitis develops.

Streptomycin is effective against *E. coli, Proteus vulgaris, A. aerogenes,* and *Pseudomonas.* It would be the agent of choice in these infections were it not for the severe toxic reaction. The aqueous solution often affects the eighth cranial nerve and causes an irreversible loss of equilibrium. The dihydrochloride of streptomycin may cause deafness. Both are nephrotoxic. Because of these severe reactions, its use is not advised for periods of more than from 5 to 7 days, and then only in fulminating cases and postoperative treatment when the oral administration of other agents is of doubtful value. The dose is 0.5 gm. every 6 hours the first day and 0.5 gm. twice daily thereafter. It is important to alkalinize the urine; this can be accomplished by giving 1 gram of sodium bicarbonate or potassium citrate every 4 hours. It is not effective when given orally, and must be given intramuscularly. Its use has been almost abandoned except in tuberculosis of the genitourinary tract, which requires such drastic therapy that the reactions to streptomycin may be disregarded.

Aureomycin is effective in the treatment of infections caused by *E. coli, A. aerogenes, Str. faecalis, Staph. aureus,* and *Str. hemolyticus.* It is the antibiotic of choice against *E. coli* and *A. aerogenes; Pseudomonas* and *Proteus* are resistant. It is administered orally beginning with an initial dose of 2 grams followed by 0.5 gram every 6 hours. The incidence of allergic reactions is minimal. Mild diarrhea and nausea are common but not disturbing. A crystalline aureomycin is available for intravenous use, but has had few indications.

Chloramphenicol is very effective against *E. coli* and *A. aerogenes* and is of value against *Staph. aureus* and *Str. hemolyticus.* Claims that

it is effective against *Proteus* infection of the urinary tract have not been substantiated. An initial dose of 2 grams is given by mouth and 0.5 gram every 6 hours thereafter is usually prescribed. Toxic reactions are minimal and chiefly gastrointestinal.

Terramycin is similar to aureomycin and chloramphenicol in therapeutic effect, dosage, and reactions.

Polymyxin is given by intramuscular injection. It is severely neurotoxic and nephrotoxic in doses of over 2.5 mg. per kg. body weight in 24 hours. The toxicity renders its general use inadvisable. Its importance lies in the fact that it is effective against *Pseudomonas* infection, and could be given for a short period to eradicate this severe and resistant organism. *Proteus* is resistant to polymyxin.

Other antibiotics recently discovered have not been given a clinical trial.

Other drugs.—Mandelic acid, calcium mandelate and other derivatives of mandelic acid are widely used in chronic cases in which the organism has become resistant to sulfonamides and antibiotics. They owe their germicidal effect to the acidity of the urine following their administration. These drugs are valuable adjuncts to therapy with antibiotics except streptomycin, which is more effective in an alkaline urine. Mandelamine, a combination of mandelic acid and methenamine, is a valuable remedy following sulfonamide and antibiotic therapy. It can be used over a long period, without deleterious effect, and is most valuable in patients with urinary retention caused by hydronephrosis, hypertrophy of the prostate, or diverticulums.

Pyridium enjoys a wide use. It is bacteriostatic but scarcely bactericidal. It is used chiefly as a sedative in patients with urinary frequency and bladder irritability, and is used following sulfonamides and antibiotics. Like serenium and methylene, it has an ocular psychic effect because the patient can "see the color" in the urine.

MISCELLANEOUS

Abacterial pyuria may present a difficult problem, with an acute fulminating onset and negative urine cultures. The symptoms are not relieved by urinary antiseptics. Tuberculosis should be ruled out. Relief is obtained by using neoarsphenamine or mapharsen. The cause has not been determined. It has been proposed that this disease may be caused by a virus or an occult staphylococcus infection.

Infections of the prostate, seminal vesicles, epididymides, and *testes* are deep seated, form abscesses early, tend to become chronic, and are not favorably effected by chemotherapy and antibiotics. The agents employed for other urinary tract infections are used with indifferent results. Local measures such as massage, irrigation, diathermy, or operative drainage are often necessary.

The symptoms of *prostatovesiculitis* have little relation to the severity of the pathologic changes. Many patients with this disease become a psychic problem.

SUMMARY

Patients with urinary tract infections tend to recover spontaneously except in the presence of stasis, calculus, diverticulum, foreign body, or other associated pathologic conditions. The excellent results reported for certain agents in the treatment of a series of patients is often the result of this tendency to recovery. Sulfonamides should not be used for longer than 2 weeks because of the danger of renal damage. Bacteria become resistant to antibiotics in from 5 to 10 days, and a change of therapeutic agent is then necessary. Acidification of the urine is beneficial except in sulfonamide-streptomycin therapy. The value of combined sulfonamide and antibiotic therapy has been definitely established. Adequate drainage and a daily fluid intake of about 3,000 cc. are of paramount importance. Mandelamine mandelic acid derivatives, pyridium, and other nontoxic therapeutic agents are valuable in the follow-up treatment.

Injection of the Lumbar Intervertebral Disks

A Diagnostic Method

Thomas I. Hoen, *M. D.* (1)

William H. Druckemiller, *Commander, MC, U. S. N.* (2)

Albert W. Cook, *Lieutenant, junior grade, MC, U. S. N. R.* (2)

PATHOLOGIC changes within the intervertebral disk and rupture of the disk capsule with herniation of disk material had been described by Beadle (3) in 1931 and noted by von Luschka (4) and Kocher (5). It was not, however, until the studies of Mixter and Barr (6) that the clinical significance of these lesions was recognized. Since that time a vast amount of literature has appeared concerning this syndrome and in 1948, Spurling and Grantham (7) summarized the experiences of these years when they wrote: "The disc controversy continues unabated fourteen years after the classic description of the disorder by Mixter and Barr. Unfortunately, the controversy is not confined to treatment methods but includes pathologic and clinical diagnostic problems as well." It is our contention that recognition of the pathologic variations of disk disease reduces the controversial aspects of both diagnosis and treatment (8).

Many surgeons believe that severe unilateral (occasionally bilateral) sciatica with unequivocal signs of a herniated disk in the lumbar re-

(1) Consultant in Neurosurgery.

(2) U. S. Naval Hospital, St. Albans, L. I., N. Y.

(3) Beadle, O. A.: The Intervertebral Discs. His Majesty's Stationery Office, London, 1931.

(4) von Luschka, H.: Die Holbgelenke des menschlichen Korpers. C. Reimer, Berlin, 1858. Quoted by Bradford, F. K., and Spurling, R. G.: The Intervertebral Disc. 2d edition. Charles C Thomas Publisher, Springfield, Ill., 1945.

(5) Kocher, T.: Die VerLetzungen der Wirbel saule zugleich als Beitrag zur Physiologie des menschlichen Ruckenmarks. Mitteilungen a. d. Grenzgeb. d. Med. u. Chir. 1: 415, 1896. Quoted in reference footnote (13).

(6) Mixter, W. J., and Barr, J. S.: Rupture of intervertebral disk with involvement of spinal canal. New England J. Med. 211: 210-215, Aug. 2, 1934.

(7) Spurling, R. G., and Grantham, E. G.: Ruptured intervertebral discs in lower lumbar regions. Am. J. Surg. 75: 140-158, Jan. 1948.

(8) Hoen, T. I.; Anderson, R. K.; and Clare, F. D.: Symposium on neurosurgery; lesions of intervertebral disks. S. Clin. North America 28: 456-466, Apr. 1948.

gion is the only indication for surgical intervention. Even those surgeons, however, who operate only on patients with these symptoms and signs, report a certain percent of negative explorations. In an attempt to improve the existing methods of diagnosis in such cases Hoen et al. *(8)* reported the use of diagnostic disk injections at operation recalling to mind Dandy's *(9)* concept of the concealed disk and pointing out that the fundamental pathologic process in this syndrome was that of degeneration of the disk without rupture of the capsule. They found that degenerated disks easily accepted many cubic centimeters of normal saline, whereas, the normal disk could not be injected. Lindblom *(10)* extended this concept to the use of this procedure as a preoperative measure. Under fluoroscopic control, he introduced a spinal needle into the disk space and subsequently injected an opaque medium. It was believed that, in this manner, the direction and nature of posterior and posterolateral protrusions of lumbar intervertebral disks could be demonstrated.

As a result of this report and of our completely satisfactory experiences with injection of lumbar disks at operation, we have employed disk injection as a preoperative diagnostic procedure in the study of intervertebral disk disease. Our interest was further stimulated by the fact that we had found, at times, that a careful history, physical examination, and pantopaque myelography were insufficient for a positive diagnosis and localization. We did not, however, feel justified in performing this procedure on patients in whom clinical examination and pantopaque myelography were considered conclusive. It is our purpose to report the use of this procedure in patients with equivocal clinical and myelographic findings.

PROCEDURE

The patient is placed in the lateral horizontal position for lumbar puncture and a 20-gage needle is introduced into the subarachnoid space at the desired level. After obtaining cerebrospinal fluid, the needle is advanced into the disk space and the position checked by fluoroscopy and spot roentgenograms (fig.1). A syringe containing normal saline solution is then attached to the spinal needle and injection is attempted. In patients with degenerated disks from 3 to 10 cc. of saline solution can be injected into the disk with relative ease, the injection becoming progressively more difficult as it is continued. Immediately before the injection, but after the needle is in place, the patient is informed that something will be done, and is instructed to describe to the

(9) Dandy, W. E.: Concealed ruptured intervertebral discs; plea for elimination of contrast mediums in diagnosis. J. A. M. A. 117: 821-823, Sept. 6, 1941.

(10) Lindblom, K.: Diagnostic puncture of intervertebral discs in sciatica. Acta orthop. Scandinav. 17: 231-239, 1948; Nord. Med. 38: 1256, 1948.

Figure 1.—Lateral roentgenogram of the lumbosacral spine showing spinal needles within the intervertebral space.

operator any new sensation that he experiences. In those in whom the injection is into a pathologic disk the patient often states that he is now experiencing the exact pain that characterized his attacks. As a variation, in several patients, 1 percent procaine solution was substituted for normal saline solution. Here, again, the positive results were dramatic. When the degenerated disk became distended, the patient complained that his pain was reproduced or accentuated; within 2 or 3 minutes the pain disappeared.

MATERIAL

This procedure has been performed on 16 patients (table 1). In 12 a positive result was obtained, and in 3 the disk was found to be normal. The remaining patient was one in whom a spinal fusion had been performed previously, and, although injection was attempted, the needle could not be introduced into the disk space at the desired level.

In the 3 in whom the disk was found to be normal, injection was attempted both in the fourth and fifth lumbar disks. Two pathologic disks were found in only 1 of the 12 patients with disk disease and the validity of the positive disk injections was confirmed (at operation) in all cases. Of the 3 in whom the results were negative, 1 has been returned home, another has been discharged to duty, and the third now attends a mental hygiene clinic. The one patient, in whom disk injection

failed, was explored because of the severity of his symptoms. The findings were failure of fusion and degeneration of the intervertebral disk at the fourth lumbar interspace. Two patients with atypical disk disease in whom injection proved helpful are here described, demonstrating the value of this procedure as a diagnostic aid.

TABLE 1.—*Results of injecting intervertebral disks in 16 patients*

Case	*Lumbar spaces injected*	*Myelography*	*Injection result*	*Operative finding*
1	Fourth	Equivocal	Positive	Protrusion*
2	Fifth	Equivocal	Positive	Extrusion**
3	Fifth	Equivocal	Positive	Extrusion
4	Fourth	Negative	Positive	Extrusion
5	Fourth and fifth	Negative	Negative	No operation
6	Fourth (failure)			Degeneration***
7	Fourth and fifth	Negative	Negative	No operation
8	Fourth and fifth	Equivocal	Positive (both spaces)	Degeneration
9	Fourth and fifth	Negative	Negative	No operation
10	Fourth	Equivocal	Positive	Protrusion
11	Fourth	Negative	Positive	Protrusion
12	Fourth	Negative	Positive	Degeneration
13	Fourth and fifth	Negative	Positive (fourth space)	Degeneration (fourth space)
14	Fourth	Negative	Positive	Protrusion
15	Fourth	Negative	Positive	Extrusion
16	Fifth	Negative	Positive	Degeneration

*Protrusion signifies that the disk material is confined to the intervertebral space but causes a bulge in the posterior ligamentous structures.

**Extrusion denotes that disk material has escaped from the disk space.

***Degeneration is used to describe the pathologically soft, boggy disk with an intact capsule.

CASE REPORTS

Case 1.—A 40-year-old man entered this hospital because of severe intermittent pain down the posterior aspect of the right lower extremity following a low back injury 4 years previously. He had been hospitalized elsewhere on several occasions because of this pain but no definite diagnosis had been made. His pain extended down the posterior aspect of the right thigh and leg into the lateral border of the right foot. It was not aggravated by coughing, sneezing, or straining and had become most severe in the weeks prior to admission. Walking and the upright position afforded almost immediate relief of his pain, and as soon as the supine position was assumed the pain would return. Following the onset of the most recent attack he had been unable to sleep in bed.

Physical examination showed that he was in acute distress. The pertinent findings were confined to his low back and right lower extremity. There was no tenderness over the low back and bending in all

directions was not painful. Straight leg raising was not restricted; Lasegue's sign was not elicited. Hyperextension of the lumbar spine did not produce pain down either lower extremity but when the patient assumed a sitting position he noted a tingling sensation in his right foot. The deep tendon reflexes were found to be normally active and equal, except the right achilles reflex which was markedly decreased, A linear area of hypalgesia was found along the lateral border of the right foot, and over this same area the skin temperature was lowered. Roentgenographic examination of the lumbar spine showed no abnormalities.

The findings on physical examination suggested impaired function of a single nerve root, and pantopaque myelography was performed with the hope that the nature of this disturbance could be ascertained. This procedure showed a slight elevation and blunting of the root sheath column at the level of the fifth lumbar intervertebral disk. Injection of the fifth lumbar disk was performed according to the technic outlined previously. After radiologic confirmation normal saline solution was slowly injected into the disk space. Four cubic centimeters of this solution were introduced, followed by an increase in the pain down the right lower extremity. When an additional 2 cc. of the fluid was injected, the pain became severe and was described as being identical to the pain which was present prior to his entry into the hospital. This sudden increment in the severity of pain did not persist as long as was expected; in fact, it subsided almost as quickly as it appeared.

The result of this injection was considered positive and subsequently the fifth lumbar disk was explored through a right interlaminal approach. The nerve root was found to be bound down to an extruded piece of disk material situated at the intervertebral foramen. The latter was removed in one piece and only a small amount of degenerated disk material could be removed from the narrowed intervertebral space. There was no evidence of any other lesion associated with this nerve root. Postoperatively, the patient made an excellent recovery and by the time of his discharge was completely asymptomatic.

Comment.—The clinical findings were entirely limited to the distribution of the first sacral nerve root with a complete absence of back pain. The obvious question was whether the diagnosis was that of a disk herniation or an isolated lesion of the first sacral root such as a cyst or tumor. The myelograms added little to our knowledge of the situation, but injection of the fifth lumbar disk disclosed the presence of disease in this structure. In addition, it was felt that disk material had been extruded through the posterior ligamentous structures, because immediately on the injection of normal saline solution the patient's root pain was reproduced exactly, but because the pain lasted only a short time, it seemed apparent that the system into which the solution had been injected was not closed, suggesting that a defect in the ligamentous structures was present, allowing escape of the injected fluid.

Case 2.—A 37-year-old man entered this hospital because of intermittent pain low in the left side of the back of several years' duration. There was no history of trauma to the back that could be correlated with his symptoms, and he had received only temporary relief from diathermy treatments.

One day prior to admission severe low back pain suddenly returned while he was in bed. He was unable to move from this position for several hours. The pain gradually decreased and on the next day he was admitted to the hospital in a wheel chair. There had never been any radiation of pain to either lower extremity, but coughing aggravated the back pain occasionally. Examination showed that he could not assume an erect posture because of severe back pain. There was scoliosis of the lumbar spine with the convexity to the right. There was loss of the normal lumbar lordosis without interlaminal tenderness. Hyperextension of the lumbar spine was found to be impossible because of severe low back pain produced by attempting this maneuver. Straight leg raising was not restricted, and Lasegue's sign could not be elicited on either side. All the deep tendon reflexes in the lower extremities were active and equal. There was no sensory defect and roentgenographic examination of the lumbar spine did not reveal any abnormalities. Pantopaque myelography was performed and the findings were inconclusive. Because it was believed that there was not sufficient evidence for the diagnosis of a herniated intervertebral disk, injection of both the fourth and fifth lumbar disks was performed according to the technic discussed previously. At each space from 6 to 8 cc. of normal saline solution could be injected without difficulty and, in each instance, generalized severe low back pain was reproduced.

The fourth and fifth lumbar intervertebral disks were explored through a left interlaminal approach. The fifth lumbar intervertebral disk was found to be soft and degenerated and at the fourth interspace the disk was degenerated and sequestrated. A large amount of pathologic material was removed from both interspaces and subsequently the patient made an uneventful recovery. When discharged from the hospital he was without low back pain, although there was still a loss of the normal lumbar lordosis.

Comment.—This patient had a completely degenerated disk which bulged against the posterior ligamentous structures and produced severe pain on weight bearing or during any activity which caused compression of two adjacent vertebras. His history revealed marked and repeated instances of severe incapacitating low back pain with each exacerbation clearing slowly after a period of rest. There was no radiation of the pain into the lower extremities. Myelography was inconclusive. In this instance disk injection again was of great assistance for on introduction of the normal saline solution the patient's exact symptomatology was reproduced. At operation the finding of degenerated soft disks at both spaces confirmed the diagnosis.

DISCUSSION

It is well known that many herniations of the intervertebral disks are readily detected by clinical examination alone. This is particularly true when the herniation causes direct pressure on single or multiple nerve roots, and is associated with characteristic postural changes. Another large number of lumbar disk herniations are identifiable by pantopaque myelography. It is also evident, however, that myelography fails to reveal a fair percent of disk lesions, particularly in those patients in whom a degenerated disk protrudes only when he is in the weight bearing position or the vertebral column is under the strain associated with activities such as running, jumping, falling, or lifting. This type of herniation often tends to recede when the patient is in a horizontal position, and, indeed, it is frequently this type of herniation which may cause the patient to complain only of back pain without radiation into either lower extremity. Frequently myelographic defects are not in agreement with the clinical findings and are, at times, not confirmed at operation *(11, 12)*.

We have long believed that in instances such as those enumerated, the ordinary diagnostic procedures have many times been far from ideal, with the result that either too many negative explorations are performed or that patients with actual disease are denied relief because of ultraconservatism. Having had much experience with the injection at operation of normal disks as well as obvious and questionable disk herniations, it occurred to us that this procedure might easily be applicable as a preoperative diagnostic aid. We have found that degenerated disks will accept by direct injection large quantities of normal saline solution, whereas it is not possible to inject a normal intervertebral disk. Furthermore, disk extrusions which leave a defect in the ligamentous structures may receive, at times, unlimited quantities of the injected solution.

The question will undoubtedly be raised as to whether one damages the normal disk by introducing a needle into it and attempting to inject normal saline solution. Friberg *(13)* studying intervertebral disk punctures in cadavers from 12 to 20 hours after death, found that he could make a hole in the annulus fibrosus of a lumbar intervertebral disk with a trocar having an outer diameter of 4.7 mm. and that, in spite of repeated flexion and extension of the spine under pressure and with great force, disk material could not be made to herniate through this hole. In some instances, he exerted as much as 8 kg. of axial pressure on the specimens, but in no case was a prolapse produced.

---

(11) Raaf, J., and Berglund, G.: Results of operations for lumbar protruded intervertebral disc. J. Neurosurg. 6: 160-168, Mar. 1949.

(12) Scoville, W. B.; Moretz, W. H.; and Hankins, W. D.: Discrepancies in myelography; statistical survey of 200 operative cases undergoing pantopaque myelography. Surg., Gynec. & Obst. 86: 559-564, May 1948.

(13) Friberg, S.: Low back and sciatic pain caused by intervertebral disc herniation; anatomic and clinical investigations. Acta chir. Scandinav. (supp. 64) 85: 1-114, 1941.

Because the procedure of the injection of intervertebral disks has been found, in our hands, to be a useful aid in the diagnosis of lumbar disk herniations, it is appropriate to discuss its advantages as well as its disadvantages when compared to other procedures used for the diagnosis of these disturbances. Besides being a further diagnostic aid in complicated cases in which both the clinical and myelographic findings are inconclusive, this injection procedure also makes it possible to predict preoperatively the existence of multiple disk herniations as well as to localize single disk protrusions. It has the advantage over myelography that an irritating chemical is not used, and thus does not have to be removed from the subarachnoid space.

The disadvantages fall into two principle categories, in that both false positive and false negative results may be obtained. A false positive results can be avoided by performing the procedure with the assistance of fluoroscopy and spot roentgenograms. In this way injections of the solution will not be made into tissues other than the intervertebral disks. False negative results may be observed when the injection is made into a portion of the disk which is not degenerated. In our experience, this is a rare occurrence and usually can be corrected by injecting different depths of the intervertebral disk. Lastly, we found that at times, the introduction of the spinal needle into the fifth cannot be accomplished with the same ease as into the fourth lumbar disk.

CONCLUSIONS

Preoperative injection of lumbar intervertebral disks is a useful measure in the diagnosis of disk disease in this region. This procedure should supplement rather than supplant the usual diagnostic methods. It is helpful in revealing lumbar disk changes in patients with low back pain unaccompanied by sciatica. Its advantages as a diagnostic method are more than sufficient, as compared to its disadvantages, to warrant its use in diagnostic problems involving lumbar intervertebral disk disturbances.

The Surgical Treatment of Inguinal Hernia in Infants and Children[1]

Ogden C. Bruton, *Colonel, MC, U.S.A.*

Sam F. Seeley, *Brigadier General, MC, U.S.A.*

ALTHOUGH the operative treatment of inguinal hernia in infants and children is a well established and accepted procedure, surgeons disagree as to the optimal age at which the infant should be subjected to operation. There is a growing belief that the repair of inguinal hernia in young infants is a simple and safe procedure and under optimal surgical conditions is indicated without too much delay when diagnosed (2,3). We wish to present an analysis of 100 consecutive patients operated on during a period of about 2 years in support of this contention.

According to Davison (4) 4.4 percent of full term and premature infants have inguinal hernia; 82 percent of them in boys and 69 percent right-sided. In our series 14 percent were premature, although the expected rate of prematurity of all births is only 5 percent; 87 percent were boys; 67 percent were right-sided, and 9 percent were bilateral, with 2 of the bilateral hernias occurring in girls.

An inguinal hernial sac represents a persistence of the fetal condition in which there is an outpocketing along the inguinal canal. The resulting hernias then are almost invariably of the indirect type, and in our series all were indirect. Although a hernial sac or defect is present at birth, the hernia itself may not be recognized until later or may never develop. Almost one-half of our patients were diagnosed before 6 months of age and 67 percent were recognized before 2 years of age.

---

(1) Walter Reed Army Hospital, Washington, D. C.

(2) Gross, R. E.: Personal communication.

(3) Schiebel, H. M., and Freeman, W. H.: Treatment of inguinal hernia in infants and children. South. M. J. 43: 605, 1950.

(4) Davison, W. C.: The Compleat Pediatrician, Duke University Press, Durham, N. C. 6th edition. p. 37, 1949

957406 O - 51 - 6

Inguinal hernia is likely to be asymptomatic unless incarceration occurs. In only 2 of our patients was pain mentioned in the absence of incarceration. Incarceration occurs frequently, especially in the young infant. The parents of 19 of our patients required a doctor to reduce the hernias a total of 34 times prior to operation. Many other times hernias were considered incarcerated but were successfully reduced by the parents. Nineteen patients required operative intervention because of incarceration or strangulation; 15 of these occurred under 1 year of age. Hydrocele was associated with hernia in 23 patients in this series. The hydrocele was often of such small size as to be unrecognized prior to operation and in these patients did not confuse the clinical picture of hernia.

Spontaneous cure is uncommon but is possible up to the age of 6 months (5). Little hope should be given parents for a natural cure, either with or without the use of various forms of truss. The infrequency of the use of a truss in our series would appear to attest to the futility with which this form of treatment is held among various physicians treating these children prior to operation. Only 7 patients had used a truss, for a time varying from 2 days to 4 years, without apparent benefit in any case. The hernia of the patient using a truss for 2 days became incarcerated after that time and required operation. There was some question as to whether or not the truss was a causative factor in the incarceration. Schiebel and Freeman (3) reported indifferent results with the use of trusses and in no case did the sac disappear as a result of this treatment. Under conditions unfavorable to surgical repair, if some form of temporary treatment seems indicated, the yarn truss described in standard surgical and pediatric texts may be used until more favorable conditions exist.

The definitive treatment of hernia is surgical. In the 100 patients operated on, 104 hernias were repaired. Five of the patients with bilateral hernia had previously had a repair on one side. At the time of operation 20 percent were under 6 months of age and 41 percent were under 2 years of age. The Bassini operation was used on 5 patients and the Ferguson or modified Ferguson on the others. The suture material was almost invariably silk, cotton being used on 4 patients and catgut on 1. The open drop ether method was used to induce anesthesia. The contents of the hernial sac were reported as small bowel, large bowel and appendix, omentum, testes, ovary and salpinx in that order of frequency.

Although no complications were reported, a 6-week-old boy was operated on during the course of a respiratory infection which progressed to a frank pneumonia after he developed an irreducible incarceration. There were no deaths in this series. The average hospital stay was 9.3

(5) Ladd, W. E., and Gross, R. E.: Abdominal Surgery of Infancy and Childhood. W. B. Saunders Co., Philadelphia, Pa., 1941. p. 357.

days; 23 patients stayed in the hospital from 2 to 5 days. There appeared to be no difference in the end results of patients having a long and those having a short hospitalization. Although no long term follow-up observations were made on all of these patients for an evaluation of the final results of operation, they all had a 3-month postoperative check-up and most of them returned to the hospital later for other treatment. There has been no known case of recurrence or testicular atrophy.

It would appear from the foregoing analysis that in a hospital having well-trained anesthetists, surgeons with great gentleness of technic and experience in handling delicate tissues in babies, and where asepsis is rigid and complete, young infants tolerate the repair of an inguinal hernia extremely well. Even better results can be expected from elective operation in the young infant rather than waiting and performing an emergency operation at the time of incarceration.

CONCLUSIONS

Inguinal hernia is a common condition which, being a congenital defect, is frequently diagnosed in the first 2 years of life. Incarceration necessitating operative intervention is frequently encountered under 1 year of age in infants with inguinal hernia. Under optimal surgical conditions infants less than 1 year of age tolerate the repair of a hernia extremely well.

ARTICLES BY PERSONNEL OF THE MEDICAL SERVICES OF THE ARMED FORCES PUBLISHED IN OTHER JOURNALS

Carmichael, D. B., Jr., Lt., MC, U. S. N.; Sprague, H. B.; Wyman, S. M.; and Bland, E. F.: Acute nonspecific pericarditis; clinical, laboratory, and follow-up considerations. Circulation 3: 321-331, Mar. 1951.

Darnall, J. R., Col., MC, U. S. A.: Sojourn in Zamboanga. Chapter 10: Moonlight on Mindanao, excursion to Borneo, and elephant oil. Military Surgeon 108: 49-58, Jan. 1951.

Darnall, J. R., Col., MC, U. S. A.: Sojourn in Zamboanga. Chapter 11: Interlude in Sulu, an ungeared mind, and a cold night on Luzon. Military Surgeon 108: 130-138, Feb. 1951.

Rapaport, E., Capt., MC, U. S. A.; Bierman, H. R.; Sokolow, M.; and Edgar, A.: Interrelationship of the electrocardiographic complexes studied by simultaneous multiple recording. American Heart Journal 41: 875-890, June 1951.

Somers, K., Lt. Col., MC, U. S. A.: Flexible shaft motor for endaural and other otolaryngic surgery, with report of illustrative cases. Military Surgeon 108: 313-319, Apr. 1951.

Somers, K., Lt. Col., MC, U. S. A.: Intravenous procaine following tonsillectomy. Annals of Otology, Rhinology, and Laryngology 50: 175-185, Mar. 1951.

Troen, P., 1st Lt., MC, A. U. S.; Kaufman, S. A., 1st Lt., U. S. A. F. (MC); and Katz, K. H.: Mercuric bichloride poisoning. New England Journal of Medicine 244: 459-463, Mar. 29, 1951.

Orbital Decompression, Transmaxillary Approach[1]

Report of a Case

Adrian J. Delaney, *Captain, MC, U. S. N*

Samuel H. Oliver, *Commander, MC, U. S. N.*

SELDOM do lesions of the orbit require emergency surgical treatment (2). In fact Holloway (3) has stated that in 32 years he had not seen a patient with cellulitis or abscess of the orbit in whom either a Krönlein (4) or Naffziger (5) procedure was indicated. Even so, acute cellulitis of the orbit is not uncommon (2) (6–10) and prior to the use of antibiotics was attended by serious complicating extension to the meninges in about 10 percent of the patients (11). One observer (12) as late as 1937 reported death by meningitis in 6 of 9 patients with orbital cellulitis.

The fulminating extension of inflammatory processes from the sinuses and contiguous structures into the orbit has been related to the following primary conditions: ethmoiditis in children under 13 years

(1) U. S. Naval Hospital, National Naval Medical Center, Bethesda, Md.

(2) Benedict, W. L.: Diseases of orbit. Am. J. Ophth. 33: 1-10, Jan. 1950.

(3) Holloway, T.: Inflammatory exophthalmos in catarrhal disorders of accessory sinuses. (Abstract of discussion.) Arch. Ophth. 15: 474, Mar. 1936.

(4) Krönlein: Zur Pathologie und Operativ. Behandlung der Dermoidzystender Orbita. Beitrage zur Klin. Chirug. IV, 1, 1887.

(5) Naffziger, H. C.: Progressive exophthalmos following thyroidectomy; its pathology and treatment. Ann. Surg. 94: 582-586, Oct. 1931.

(6) Cohen, M.: Inflammatory exophthalmos in catarrhal disorders of accessory sinuses. Tr. Sect. Ophth., A. M. A., pp. 209-228, 1935; also Arch. Ophth. 15: 457-476 Mar. 1936.

(7) O'Brien, C. S., and Leinfelder, P. J.: Unilateral exophthalmos; etiologic and diagnostic studies in 82 consecutive cases. Am. J. Ophth. 18: 123-132, Feb. 1935.

(8) Smith, A. T., and Spencer, J. T., Jr.: Orbital complications resulting from lesions of sinuses. Ann. Otol., Rhin. & Laryng. 57: 5-27, Mar. 1948.

(9) Hickman, W. R.: Periorbital cellulitis; report of 4 cases. J. Indiana M. A. 41: 501-504, May 1948.

(10) Donahue, H. C.: Orbital cellulitis followed by total blindness. Am. J. Ophth. 29: 1574-1577, Dec. 1946.

(11) Hudson, A. C.: Primary Tumors of the Optic Nerve. Roy. London Ophth. Hosp. Rep. 18 (pt.3): 317-439, 1912.

(12) Hubert, L.: Orbital infections due to nasal sinusitis, study of 114 cases. New York State J. Med. 37: 1559-1564, Sept. 15, 1937.

of age (13), frontal and maxillary sinusitis in the adult (2), furuncle in the vestibule of the nose, lacrimal sac phlegmon, dacryadenitis, palpebral abscess, cavernous sinus thrombosis, osteomyelitis, periostitis, actinomycosis, injury, dental infection, influenza, erysipelas, scarlet fever, and smallpox. The causative organism is most commonly reported as a streptococcus or staphylococcus (2). In 75 consecutive cases of unilateral exophthalmos, 32 were inflammatory (7).

If the patient presents at first marked edema of the lids with exophthalmos and limitation of motion, radical measures are immediately advisable (14).

When loss of vision or other serious damage seems evident, surgery of the orbit is justified (15). Spaeth (16) advises that "Cellulitis (within the orbit) is occasionally properly incised and no suppuration uncovered. Drainage should be established in these, however, just the same * * *. The greatest error is not premature incision and drainage, but delay of incision and drainage." Axenfeld (17) even advises, in these desperate cases of acute inflammation, a Krönlein operation which may expose the infected locality.

CASE REPORT

A 26-year-old man was admitted to the hospital on 23 August 1950 complaining of rapid onset of swelling, pain, and blindness in the left eye of 8 hours' duration. The past history indicated that on or about 1 August he had had swelling of the left orbit which had subsided rapidly under treatment with penicillin. The condition had been treated as an acute sinusitis and there had been no interference with vision or ocular movements.

Examination on admission revealed an apprehensive young man in great distress. The right eye was normal and had a visual acuity of 20/20. The left eye presented a proptosis of 11 mm. and retrobulbar resistance was so increased that the eyeball could not be palpably shifted. Both left eyelids were slightly reddened and thickened. The upper lid was indurated. Neither lid was warm to touch. The upper lid was ptotic. The bulbar conjunctiva was markedly injected, chemotic, and protruded in a sausage-roll manner through the immobile

(13) Davis, W. B.: Sinusitis in children. Ann. Otol., Rhin. & Laryng. 41: 493-500, June 1932.

(14) Porter, C. T.: Etiology and treatment of orbital infections. Ann. Otol., Rhin. & Laryng. 41: 1136-1141, Dec. 1932.

(15) Benedict, W. L.: Surgical treatment of tumors and cysts of orbit; eleventh de Schweinitz lecture. Am. J. Ophth. 32: 763-773, June (pt. 1) 1949.

(16) Spaeth, E. B.: The Principles and Practice of Ophthalmic Surgery. 3d edition. Lea and Febiger, Philadelphia, Pa., 1944. p. 89.

(17) Axenfeld: Ueber plastischen Verschluss der Orbita. Bericht der 27 Versammlung deutscher Naturf. und Aerzte, 1903; cited by Wood, C. A.: Part V, Chap. I: Some operations on the orbital walls and contents. In Wood, C. A. (editor): A System of Ophthalmic Operations, Vol. I. Cleveland Press, Chicago, Ill., publishers, 1911. pp. 813-860.

lids. The eyeball was fixed in the primary position. There was tenderness on deep palpation. The cornea and anterior chamber were normal. The pupil was dilated and absolutely areflexive. The media were clear. The retinal veins were slightly engorged and edema of the retina was seen in the posterior pole. There was no light perception in the left eye. The remainder of the physical examination was negative except for slight clouding of the left anterior group of paranasal sinuses on transillumination. The leukocyte count was 16,000.

Treatment with 300,000 units of penicillin t.i.d. and 500 mg. of aureomycin every 6 hours was started. It was obvious that we were confronted with a fulminating orbital cellulitis which had not reached the stage of abscess formation when first seen. The source of the orbital inflammation could not be determined because there was no evidence of purulent discharge in the left side of the nose or nasopharynx, no point tenderness over the left anterior group of sinuses, and no pus on irrigation of the left maxillary sinus. The eye was already blind, and it was believed that permanent loss of all or part of the central vision would be unavoidable unless an adequate decompression of the orbit could be obtained. The Naffziger, Shugrue-Moran, and Sewall technics were deemed inadvisable for one reason or another. The transmaxillary approach described by Hirsch *(18)* for decompression of the orbit in malignant exophthalmos appealed to us because of its simplicity, its ready availability, the feasibility of using local anesthesia, and the fact that no special instruments are needed. It was decided to open the antrum through the canine fossa and to inspect the interior. If frank pus should be found, only adequate drainage of the sinus through the inferior meatus of the nose would be accomplished.

On the day of admission the patient was taken to the operating room. Analgesia was obtained by preliminary administration of seconal and meperidine hydrochloride 90 minutes before operation. The nasal fossa on the left was well cocainized, including the area of the sphenopalatine ganglion. The maxillary division of the trigeminal nerve was blocked with 2 percent procaine using the infrazygomatic approach. The gums over the left canine fossa were thoroughly infiltrated with procaine. A horizontal incision was made 1 cm. above the gum margins of the upper left lateral incisor, canine, and premolar teeth. The mucoperiosteum was widely elevated, and the antrum opened at a level 1 cm. above the line of incision. A large window was made in the anterior wall of the antrum and the contents of the sinus were thoroughly inspected. A cystic degeneration of the lining mucosa was seen. The entire mucosa was removed with little difficulty leaving clean bare walls. The roof of the sinus was then reduced to tissue-paper thickness by long-handled polishing burs. The bone underlying the infraorbital nerve was spared but the remainder of the roof of the antrum

(18) Hirsch, O.: Surgical decompression of malignant exophthalmos. Arch. Otolaryng. 51: 325-334, Mar. 1950.

was thinned and removed without disturbing the orbital periosteum. After the periorbita had been uncovered over a large area the fascia was incised from behind forward on each side of the infraorbital groove. This resulted in an immediate bulging of the orbital fat into the maxillary sinus and in a subjective sense of relief of pressure for the patient. A large window was then created into the inferior meatus of the nose and iodoform gauze was packed lightly into the sinus. The mouth wound was then tightly closed over bone.

The patient tolerated the operation very well, and felt great relief although there was no spectacular objective improvement. Retrobulbar resistance was, however, palpably decreased. The patient spent a comfortable night. On 25 August the objective findings were essentially the same except that the brawny induration in the left upper lid now showed an area of beginning softening in the upper outer aspect. Incision and drainage in this area recovered 15 cc. of thick yellow-brown pus from which an alpha streptococcus was cultured.

Immediately after drainage of the abscess the proptosis began to recede. The drainage continued for 12 days after which no further discharge could be obtained from the orbit. The conjunctival chemosis subsided gradually over a period of 3 weeks. Central vision began to reappear 2 days after the abscess was drained, and improvement

Figure 1.—Photograph of patient taken 4 months after operation showing the enophthalmos which was produced.

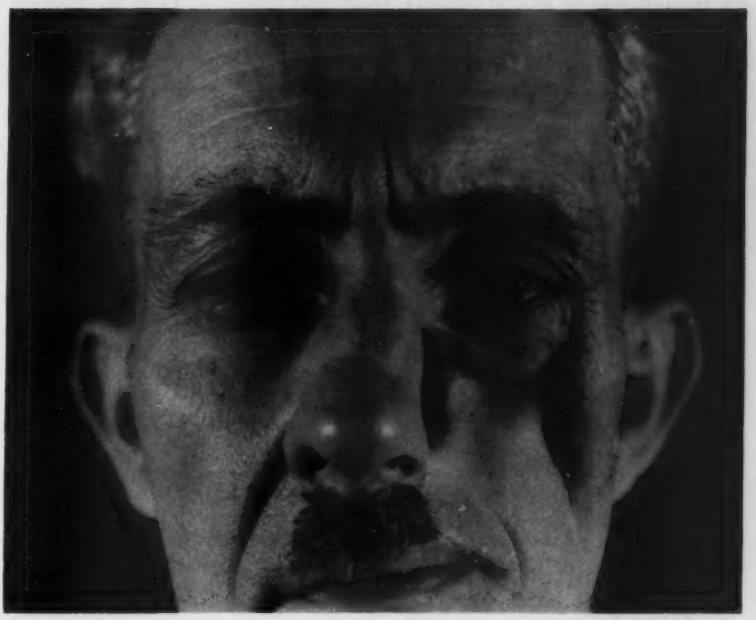


Figure 2.—Another patient in whom the entire left maxilla had been removed because of carcinoma. Although the entire floor of the orbit and the inferior orbital rim are absent, the orbital periosteum was not disturbed, and no enophthalmos occurred.

progressed rapidly. Ten days postoperatively the patient could count fingers at 6 feet with the left eye. Fourteen days postoperatively the vision was 20/30, and this had improved to 20/20 3 weeks later, following patch occlusion of the right eye. Unfortunately, the visual fields did not improve as well as was expected. Four months after the orbital decompression there was still marked restriction of the peripheral fields nasally and superiorly. The extraocular movements had returned completely except for slight restriction of adduction. There was no diplopia. The exophthalmos of the left eye, which measured 11 mm. more than the right eye on admission, was gradually replaced in the 4 months following operation by a moderate enophthalmos (figs. 1 and 2) measuring 2.5 mm. less than the right eye.

Comment.—The treatment of orbital cellulitis frequently includes several specialties. In the case presented, early consultation between the rhinologist and ophthalmologist permitted the prevention of blindness. Fralick *(19)* emphasizes the fact that the neurosurgeon has proved to the ophthalmologist the value of the transcranial approach

(19) Fralick, F. B.: The orbit, review of literature. Arch. Ophth. 44: 437-453, Sept. 1950.

for the removal of orbital lesions. Many and varied surgical approaches to the orbit have been introduced especially in attempts to secure decompression for relief of acute inflammatory and malignant (thyrotropic) exophthalmos. Operations on the orbital walls have been described as follows: (1) removal of the roof of the orbit by the transcranial approach (Naffziger) *(5) (16) (20–22)*; (2) removal of the lateral wall by modifications in the original Krönlein approach *(16) (23) (24)*; (3) removal of the medial orbital wall *(25) (26)*; and (4) removal of the floor of the orbit by the transmaxillary approach *(18) (27–30)*. The advantages and disadvantages to be considered in the choice of procedure are ably outlined by Hirsch *(18)*.

SUMMARY

The rapid onset of blindness in the patient with acute orbital cellulitis here presented was prevented by emergency orbital decompression. The transmaxillary approach is recommended for emergency decompression of the orbit for progressive exophthalmos.

---

(20) Naffziger, H. C.: Our present knowledge of exophthalmos and its surgical treatment. Cincinnati J. Med. 29: 329-334, June 1948; Ann. West. Med. & Surg. 2: 397-401, Sept. 1948.

(21) Dandy, W. E.: Results following transcranial operative attack on orbital tumors. Arch. Ophth. 25: 191-216, Feb. 1941; correction 25: 749, Apr. 1941; also, Tr. Sect. Ophth., A. M. A., pp. 92-120, 1940.

(22) Love, J. G., and Benedict, W. L.: Transcranial removal of intraorbital tumors. J. A. M. A. 129: 777-784, Nov. 17, 1945.

(23) Guyton, J. S.: Decompression of orbit. Surgery 19: 790-809, June 1946.

(24) Swift, G. W.: Malignant exophthalmos and operative approach. West. J. Surg. 43: 119-126, Mar. 1935.

(25) Sewall, E. C.: Operative control of progressive exophthalmos. Arch. Otolaryng. 24: 621-624, Nov. 1936.

(26) Kistner, F. B.: Decompression for exophthalmos; report of 3 cases. J. A. M. A. 112: 37-38, Jan. 7, 1939.

(27) Hirsch, O. and Urbanek: Behandlung eines excessiven Exophthalmos (Basedow) durch Entfernung von Orbitalfett von der Kieferhohle aus. Monatschr. f. Ohrenh. 64: 212-213, 1930.

(28) Meesmann, A.: Operativ Behandlung des Malignen Exophthalmos. Zentralbl. f. d. ges. Ophth. 45: 161, 1940.

(29) Wust, K.: Zur Behandlung der drohenden Optikusatrophie infolge retrobulbärer Hämatome und die chirurgischen Zugänge zum retrobulbären Raum unter besonderer Berücksichtigung des permaxillaren Weges. Klin. Monatsbl. f. Augenh. 114: 140-144, 1949.

(30) Lewkowitz, A.: Zur permaxillaren Eröffnung der Orbita. Ztschr. f. Laryng., Rhin., Otol. 22: 320-325, 1932.

Eosinophilic Granuloma of the Lung[1]

Report of Two Cases

Charles J. Farinacci, *Colonel, MC, U. S. A.*
Hugh C. Jeffrey, *Major, R. A. M. C.*
Robert W. Lackey, *Major, MC, U. S. A.*

A BIOPSY of lung tissue from two patients recently treated at this hospital revealed an eosinophilic granulomatous lesion resembling the eosinophilic granuloma of bone. A survey of the literature indicates that, although cases of eosinophilic granuloma of bone with roentgenologic evidence of pulmonary infiltration have been described, no histologic confirmation of a similar lesion in the lungs alone has been previously reported.

CASE REPORTS

Case 1.—In the winter of 1948-1949 a 32-year-old man developed a chronic cough productive of from 50 to 120 cc. of sputum daily. He complained of fatigue and sweats, but denied having fever or chills. He was admitted to this hospital with the provisional diagnosis of pulmonary tuberculosis. He had lost about 40 pounds. He gave a history of exposure to dust from September 1947 to January 1948.

Physical examination was negative except for the presence of rales in both lungs. Roentgenograms revealed a patchy linear nodular parenchymal infiltration of both lungs (fig. 1A). The total leukocyte count was 18,500 with 83 percent polymorphonuclear neutrophils but no eosinophils. A tuberculin (PPD first strength) skin test was 1 plus; a histoplasmin skin test was 2 plus; and a coccidioidin skin test was negative. Repeated examinations of the sputum revealed no acid-fast bacilli or fungi.

On 24 August 1949, a thoracotomy was performed and tissue from the lower lobe of the left lung was removed for examination. The specimen consisted of a wedge of lung tissue measuring 5 by 1.5 cm. Pea-sized hard nodules were felt scattered throughout. Over the nodules the pleura

---

(1) Fitzsimons Army Hospital, Denver, Colo.

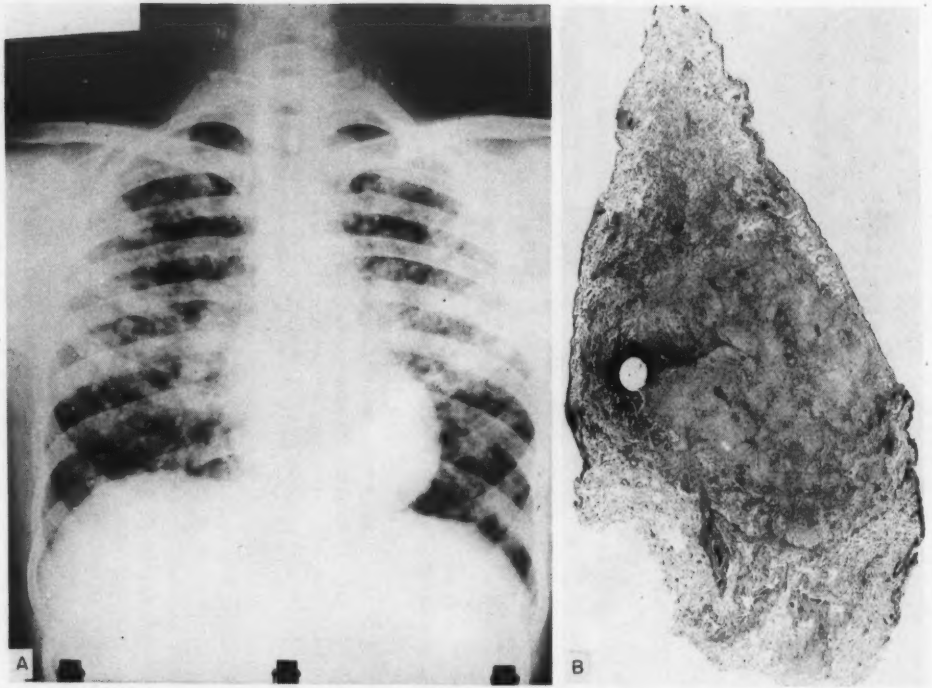


Figure 1.—Case 1. (A) *Roentgenogram showing nodular infiltration throughout both lungs.* (B) *Photomicrograph of lung tissue showing the characteristic nodular infiltration.*

was thickened and hyalinized in some areas. The cut surface showed scattered irregular rounded grayish white nodules. The largest nodule measured 1 by 0.7 cm. Those that reached the pleura merged with it.

Histologic examination revealed a granuloma with an unusual eosinophilic polymorphonuclear infiltrate in the fibrosing miliary lesions (fig. 1B). Many histiocytic cells and xanthomatous macrophages were also seen. There were a few lymphocytes and some foreign-body giant cells in among the fibrous trabeculas. The alveolar architecture in these areas was completely obliterated by this fibrous tissue containing the eosinophils, pigment-laden macrophages, and histiocytes (fig. 2).

Cultures from the lung tissue were negative for acid-fast bacilli and fungi. No organisms or parasites have been demonstrated in the special stains. This lesion had the appearance of an inflammatory granulomatous process rather than that of a neoplasm. The eosinophils and histiocytes lying in a fibrous stroma constitute a finding characteristic of an eosinophilic granuloma in bone.

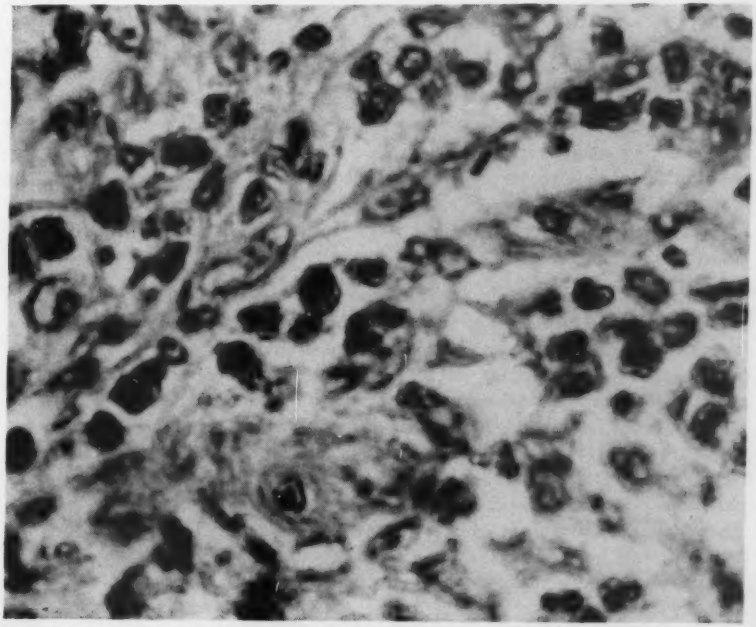


Figure 2.—Case 1. Photomicrograph showing the pale-staining histiocytes and groups of dark-staining eosinophils.

Case 2.—In September 1950, a 24-year-old man had a routine roentgenogram of the chest which showed a diffuse type of increased density throughout both lungs. He stated that he had had a chronic cigarette cough productive of from 4 to 6 cc. of thin whitish sputum daily for the preceding 2 or 3 years and that he had lost about 5 pounds in the preceding 8 months but he denied having chills, sweats, fever, hemoptysis, and malaise. His afternoon temperature in the hospital varied between 99° and 100° F. Prior to entering the Army he had driven a truck carrying dry sand and cement.

Physical examination was negative except for the presence of a small, nontender, movable node in his left axilla. The total leukocyte count was 14,250 with 60 percent neutrophils and 10 percent eosinophils. A tuberculin (PPD second strength) test and skin tests for blastomycosis and histoplasmosis were positive. The coccidioidin skin test and the complement fixation test for histoplasmosis were negative. Repeated examinations of the sputum and gastric washings were negative for *tubercle bacilli* and fungi. A roentgenogram of the chest on 24 October showed no change (fig. 3A). Roentgenograms of the hands and feet showed no abnormalities.

On 13 November a thoracotomy was performed on the left side. Numerous firm buckshot-sized nodules could be palpated throughout both lobes of the left lung. The lung surface over these nodules was dimpled. The hilar lymph nodes were not enlarged. Tissue for examination was taken from the upper and lower lobes of the left lung. The specimen consisted of two small pieces of tissue in which small, firm, but not stony, nodules could be palpated. Their cut surface was yellow and not sharply circumscribed. They varied in size from 0.4 to 1.5 cm. in diameter. Smears and cultures for *tubercle bacilli* and fungi made from these lesions were negative.

Histologic examination revealed nodules replacing the lung tissue (fig. 3B). They consisted of bands of fibrous tissue containing lobulated masses of eosinophils and histiocytic cells (figs. 4 and 5). The histiocytes had large vesicular nuclei and the cytoplasm was fragmented in some. In others, the cytoplasm was more abundant and vacuolated. Some large macrophages were laden with brown pigment. Scattered throughout were giant cells formed of nuclear aggregations with little cytoplasm. Occasionally typical foreign-body giant cells were seen. The eosinophils were numerous and in some areas they appeared in large clumps. These eosinophils were mostly of the mature type. This granulomatous process was not circumscribed but areas of lung wherein the architecture was completely destroyed, adjacent areas which were atelectatic, and areas of normal-appearing lung tissue were noted. No organisms or parasites were demonstrated in the specially stained sections prepared at the Armed Forces Institute of Pathology.

Roentgenograms of the long bones and skull taken 1 week after thoracotomy revealed no abnormalities.

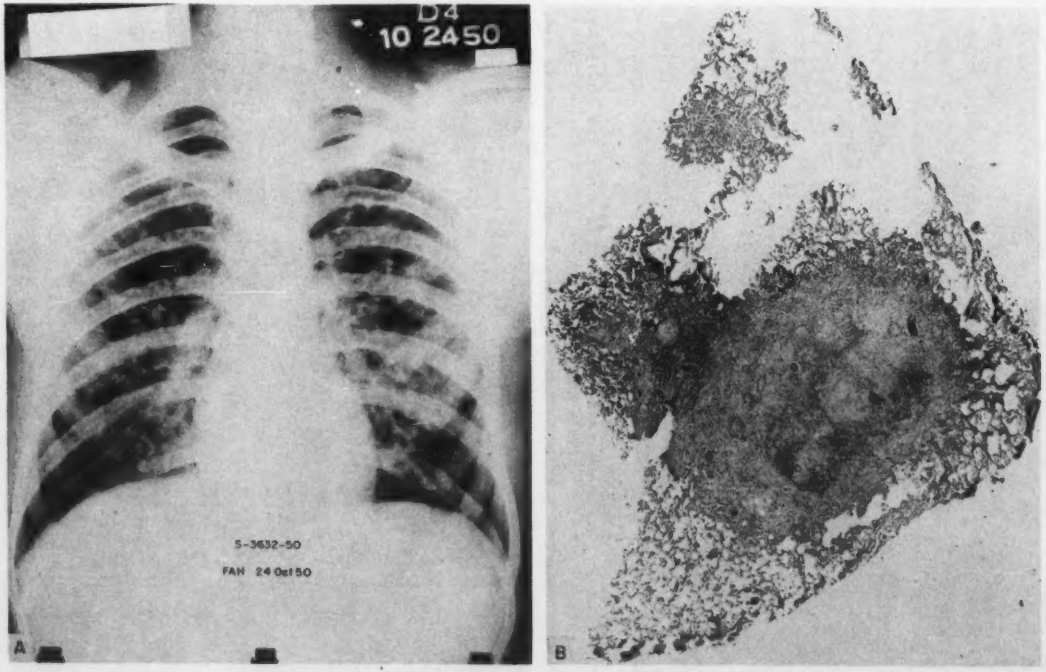


Figure 3.—Case 2. (A) *Roentgenogram showing mottled density throughout both lungs.* (B) *Photomicrograph of lung tissue showing the nodular lesion.*

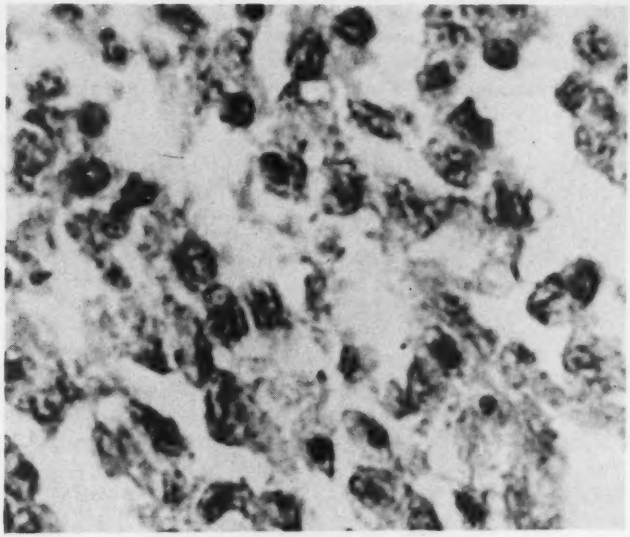


Figure 4.—Case 2. Photomicrograph showing a field in which the histiocytic cells predominate.

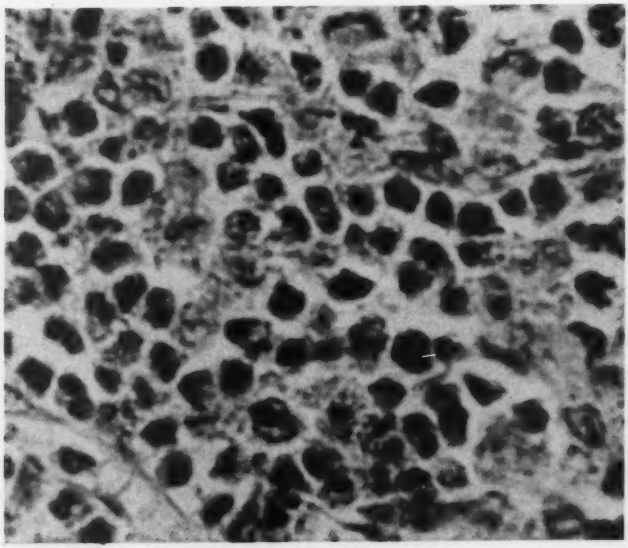


Figure 5.—Case 2. Photomicrograph showing a field in which the eosinophils predominate.

DISCUSSION

Eosinophilic granuloma of bone was first reported by Finzi *(2)* as "a myeloma with preponderance of eosinophilic cells." It was not until 1940 that this condition was established as a well-defined disease entity by Otani and Ehrlich *(3)* and Lichtenstein and Jaffe *(4)*. Since the first descriptions of the disease, there has been a tendency to expand the diagnosis of eosinophilic granuloma of bone to include those cases in which there are multiple bone lesions and even extra-osseous lesions, such as those involving lymph nodes, skin, lungs, and other organs *(5)*.

In 1949 Vanek *(6)* described six cases of an eosinophilic granulomatous process involving the submucosa of the stomach, for which he suggested the term "gastric submucosal granuloma with eosinophilic infiltration." Histologically, the lesions were characterized by a fibroblastic reaction with an even distribution of eosinophilic cells throughout. Vanek considered these granulomatous lesions to be different from the eosinophilic granulomas found in bones. Polayes and Krieger *(7)* described a jejunal lesion which was histologically identical to that of Vanek's eosinophilic granuloma of the stomach and apparently did not have any relationship with eosinophilic granuloma of the bone marrow.

Curtis and Cawley *(8)* reported a 16-month-old female infant with a widespread eosinophilic granulomatous infiltration of the skin and multiple skeletal defects. Biopsies of the cutaneous lesions revealed findings similar to those found in eosinophilic granuloma of bone. Biopsy of the skeletal lesions was not performed.

The pulmonary syndrome described by Löffler *(9)* occurs as transient pulmonary infiltrations, often recurrent, accompanied by cough, pyrexia, asthmatic symptoms, and a high peripheral eosinophilia. Roentgenograms of the lungs of these patients show findings similar to those of eosinophilic granuloma of the lungs but, as stressed by Caffey *(10)*, the diagnostic feature in Löffler's syndrome is the fleeting and migratory char-

(2) Finzi, O.: Mieloma con prevalenza delle cellule eosinofile, circoscritto all'osso frontale in un giovane di 15 anni. Minerva med. (pt. 1) 9: 239-241, Feb. 17, 1929.

(3) Otani, S., and Ehrlich, J. C.: Solitary granuloma of bone simulating primary neoplasm. Am. J. Path. 16: 479-490, July 1940.

(4) Lichtenstein, L., and Jaffe, H. L.: Eosinophilic granuloma of bone, with report of case. Am. J. Path. 16: 595-604, Sept. 1940.

(5) Henderson, E. D.; Dahlin, D. C.; and Bickel, W. H.: Eosinophilic granuloma of bone. Proc. Staff Meet. Mayo Clin. 25: 534-541, Sept. 13, 1950.

(6) Vanek, J.: Gastric submucosal granuloma with eosinophilic infiltration. Am. J. Path. 25: 397-411 incl. 2 pl., May 1949.

(7) Polayes, S. H., and Krieger, J. L.: Eosinophilic granuloma of jejunum, a hitherto undescribed lesion of the intestines. J. A. M. A. 143: 549-551, June 10, 1950.

(8) Curtis, A. C. (Ann Arbor, Mich.), and Cawley, E. P.: Eosinophilic granuloma of bone with cutaneous manifestations; report of case. Arch. Dermat. & Syph. 55: 810-818, June 1947.

(9) Löffler, W.: Die flüchtigen Lungeninfiltrate mit Eosinophilie. Schweiz. med. Wchnschr. 66: 1069-1078, Nov. 7, 1936. Cited in reference footnotes *(10)* and *(12)*.

(10) Caffey, J.: Pediatric X-ray Diagnosis. 2d edition. The Year Book Publishers, Inc., Chicago, Ill., 1950. p. 245.

957406 O - 51 - 7

acter of the roentgenographic changes. The morbid changes in the lungs have been examined in only a few cases *(11)*; these studies revealed an exudative type of lesion. Specific allergenic factors such as amebas, intestinal worms, and plant pollens have been identified as causative agents in several cases *(12)*. The elimination of these specific agents has resulted in permanent cure. On both histologic and persistent roentgenographic appearances our cases resemble the eosinophilic granulomas of bone rather than the eosinophilic infiltrations of Löffler and allied allergic reactions in the lungs.

Cases of eosinophilic granuloma of bone with pulmonary infiltration similar to our two cases have been described by others *(13) (14) (15)* but in none of these was biopsy of lung tissue performed and the authors could only infer that the pulmonary lesions were of the same nature as those found in the bones. That pulmonary infiltrations occur in eosinophilic granuloma has been recognized in retrospect since Rowland *(16)* reported the case of a 5-year-old boy who died from pulmonary fibrosis secondary to xanthomatosis. Since then many cases have been reported and reviewed.

Parkinson *(15)* suggested the possibility of pulmonary infiltration occurring as the sole manifestation of the chronic form of eosinophilic granuloma. Because in our two cases, there was no evidence of coexistent osseous or other extra-osseous lesions we must conclude that these patients have no manifestations of eosinophilic granulomatous involvement other than the pulmonary lesions. These patients are being kept under observation for any further progress of the disease.

Farber *(17)* and Green and Farber *(18)* were the first to postulate that eosinophilic granuloma, Hand-Schüller-Christian disease, and Letterer-Siwe disease represented "variations in degree, stage of development and localization of the same basic disease process." Most authors who

(11) von Meyenburg, H.: Das eosinophile Lungeninfiltrat; pathologische Anatomie und Pathogenese. Schweiz. med. Wchnschr. 72: 809-811, July 25, 1942. Cited in reference footnote *(10)* and by Lewis, G. M., and Cormia, F. E.: Eosinophilic granuloma; theoretic and practical considerations based on study of case. Arch. Dermat. & Syph. 55: 176-193, Feb. 1947.

(12) Jones, S. H., and Souders, C. R.: Eosinophilic infiltration of lungs (Loeffler's syndrome). New England J. Med. 231: 356-358, Sept. 7, 1944.

(13) Weinstein, A.; Francis, H. C.; and Sprofkin, B. F.: Eosinophilic granuloma of bone; report of case with multiple lesions of bone and pulmonary infiltration. Arch. Int. Med. 79: 176-184, Feb. 1947.

(14) Schuknecht, H. F., and Perlman, H. B.: Hand-Schüller-Christian disease and eosinophilic granuloma of skull. Ann. Otol. Rhin. & Laryng. 57: 643-676, Sept. 1948.

(15) Parkinson, T.: Eosinophilic xanthomatous granuloma with honeycomb lungs. Brit. M. J. 1: 1029, pl., June 11, 1949.

(16) Rowland, R. S.: Xanthomatosis and reticulo-endothelial system; correlation of unidentified group of cases described as defects in membranous bones, exophthalmos and diabetes insipidus (Christian's syndrome). Arch. Int. Med. 42: 611-674, Nov. 1928.

(17) Farber, S.: Nature of "Solitary or eosinophilic granuloma" of bone. Am. J. Path. 17: 625-626, 1941.

(18) Green, W. T., and Farber, S.: "Eosinophilic or solitary granuloma" of bone. J. Bone & Joint Surg. 24: 499-526, July 1942.

have since written on eosinophilic granuloma of bone have accepted this point of view. Thannhauser *(19)* was of the opinion that eosinophilic granuloma of bone was the monosymptomatic form of a systemic granulomatous disorder in which histiocytes, eosinophils, and xanthoma cells are observed in the lesion at different phases. He proposed the term "eosinophilic xanthomatous granuloma" as an all inclusive term for Letterer-Siwe disease, Hand-Schüller-Christian disease, and eosinophilic granuloma.

The causative agent of eosinophilic granuloma has not been established. Most authors now believe it is caused by some infectious agent rather than a metabolic disorder on the basis of the type of tissue reaction and the acute febrile course in infants. The search for a bacterial, fungal, or viral causative agent has so far been fruitless.

CONCLUSIONS

The term eosinophilic granuloma should be expanded to include those cases in which there are extra-osseous lesions such as those involving skin, lungs, and other organs. It is suggested that the two cases of pulmonary eosinophilic granuloma here reported are, like eosinophilic granuloma of bone, the monosymptomatic form of a systemic xanthomatous disorder.

(19) Thannhauser, S. J.: Lipidoses. Oxford University Press, New York, N. Y., 1940. Cited by Thannhauser, S. J.: Eosinophilic granuloma of bone. J. A. M. A. 134: 1437-1438, Aug. 16, 1947; correction 135: 46, Sept. 6, 1947.

The Talus in Congenital Equinovarus Clubfoot

Thomas M. Foley, Jr., *Commander, MC, U. S. N. (1)*

A REVIEW of a derangement of the talus which occurred frequently in 100 patients with congenital clubfoot is presented. This condition has not been described per se in the available literature. Lateral displacement of the distal end of the talus occurs frequently in congenital clubfoot. This altered relationship of the distal end of the talus to the line of the tibia and fibula can be observed on anteroposterior roentgenograms of the foot and lower leg (fig. 1). Occasionally the entire talus appears to be displaced (fig. 1A). In order to evaluate the nature of this displacement, roentgenograms of normal feet were studied. It was found that when the normal foot was placed in a position of equinovarus, the position of the distal end of the talus in the anteroposterior view was not appreciably affected except for a slight mediad deviation in the direction of the deformity. Therefore it is considered that when lateral displacement occurs, it represents a subluxation (figs. 1 and 2).

The mechanics for such a subluxation are easily understandable when one considers the anatomy of the astragalus and the character of the deformity of equinovarus. In this position the normal support of the malleoli, calcaneus, and distal structures is lost. Concurrently stretching of the lateral ligaments occurs and the distal elements encroach on the space normally occupied by the talus. The longer this abnormal position is maintained, the more apt the talus is to adjust itself to it in shape as well as in function. Descriptions of anatomic dissections of clubfeet in the literature have been based on the examination of old untreated cases and, in these, deformity of the talus has been described as an elongated neck pointing downward and inward. This, however, can be explained by a persistence of cartilage where the bones are in contact with each other, growth subsequently occurring in that direction.

Being convinced that subluxation does occur and that there was a reasonable explanation for its existence, it then became necessary to

(1) At the time of writing this article at Shriners' Hospital for Crippled Children, Honolulu, T. H.; now at U. S. Naval Hospital, Philadelphia, Pa.

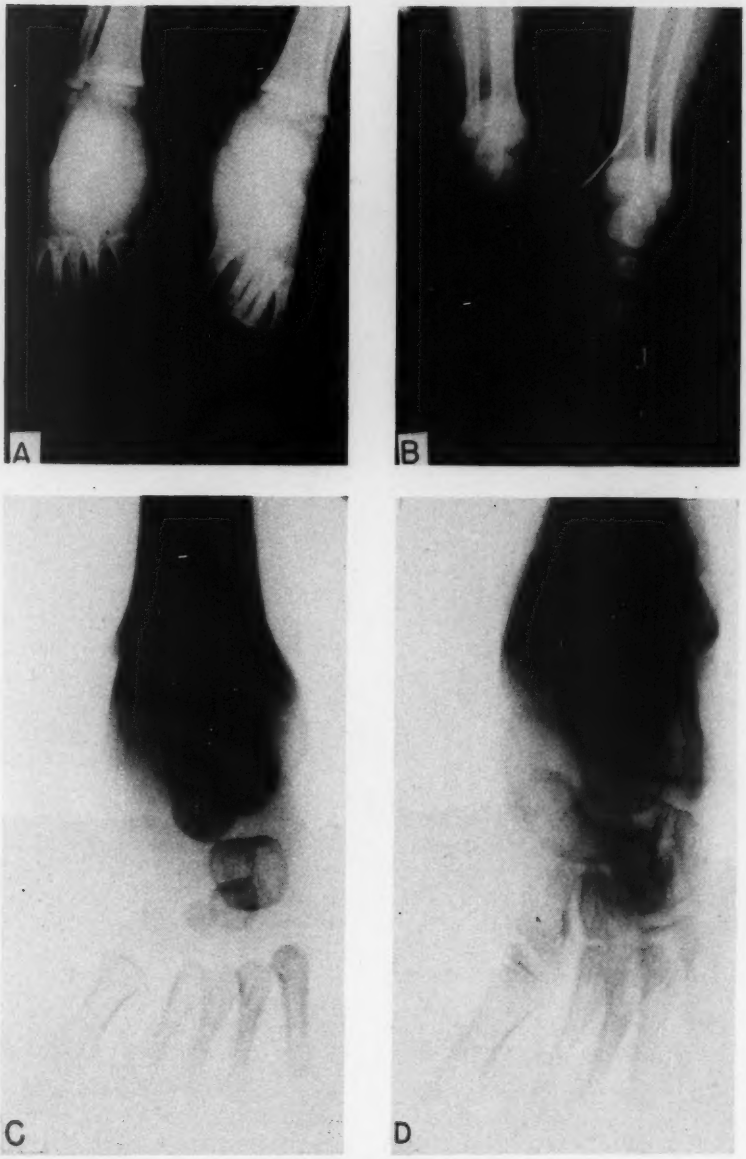


Figure 1.—Talar subluxation in different patients and at different ages. (A) *The talus appears to be almost completely displaced.* (B) *Normal foot for comparison with clubfoot.* (C and D) *Correction of angle has not been obtained and dorsiflexion remains limited.*

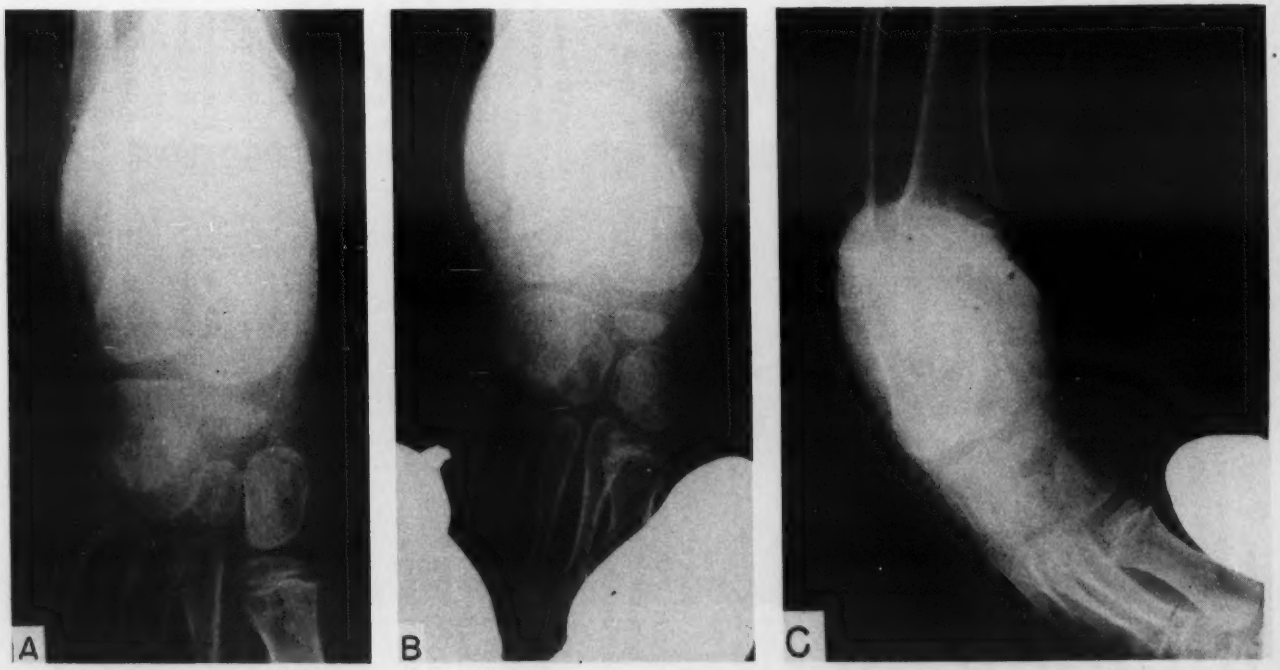


Figure 2.—The normal foot in (A) *neutral,* (B) *abduction, and* (C) *equinovarus. The talus is relatively stable and maintains its usual angle with the line of the tibia.*

determine of what, if any, clinical significance it might be. One hundred cases of clubfoot and the available roentgenograms were reviewed. Clinical examination of 50 percent of these patients was made. The clubfeet were classified as simple, persistent, and recurrent, based on the response to treatment rather than on any definable element found on original examination. It was found that the age at which treatment was started did not materially affect the ultimate result obtained within each group, and that the incidence of the persistent type was the same in those treated prior to 6 months of age as in those in whom treatment was started later. The persistent type was increasingly more common in those in whom treatment was started late, or in those in whom treatment had been interrupted.

The lack of completeness and uniformity in reporting the conditions of the foot; the irregular intervals between reports and the diversity of the methods employed, whether conservative or surgical, made exact classification difficult and evaluation of results of treatment with any one method impossible. Roentgenograms of each patient were not available but a sufficient number were available to demonstrate that talar subluxation could occur as part of the original deformity, although it was more commonly seen in the persistent and recurrent types, particularly in the latter. On the basis of these observations, it is believed that talar subluxation is of clinical significance only when it is a persistent part of the deformity and that in consideration of its nature it could conceivably prevent satisfactory correction of the varus and equinus elements.

Although treatment of this subluxation per se has not been attempted, in view of the findings in this series, it would appear that treatment may become necessary in certain persistent cases. Furthermore, on the basis of the anatomic changes which can be expected, this treatment should be devised to accommodate the condition at the various stages of growth. Therefore, in the early cases attempts should be directed at reduction. Later, when the talus has accommodated itself to an abnormal position, efforts should be directed toward alining the distal elements on the talus. This may not be possible and a decision must be made, whether to perform early open reduction, or to maintain the degree of correction obtained by some apparatus until the age of the child will permit a definitive reconstructive procedure, if then still necessary. In an older child a subastragalar fusion would be indicated.

Regardless of the procedure employed, it is believed that attempts to force correction, in view of the talar subluxation with its altered anatomic relationship, will cause damage to the ankle joint. Early damage to the ankle joint in young children may not be apparent because of the great mobility of the os calcis on the astragalus (fig. 3), but, since the mobility is gradually lost as adolescence is reached, evidence of ankle injury will then become manifest.

Figure 3.—Lateral views of the foot of a normal 6-year-old child. The excursion of the talus and calcaneus from equinus through neutral to dorsiflexion is shown. Note how the calcaneus passes the talus to assume its normal lateral position.

The ability to re-establish the talocalcaneal angle is still the best criterion for determining satisfactory correction of the heel varus; this must precede attempts at correcting the equinus deformity, as it is only then that the os calcis can pass the talus and assume its normal lateral contact as shown in figure 3. If the talar subluxation cannot be corrected, it is obvious that neither the angle nor the ability of the calcaneus to pass the talus can be re-established, unless the calcaneal deformity is overcorrected. If deformity of the talus prevents satisfactory ankle motion in itself, some consideration should be given to increasing the joint space by such operative procedures as low fibular osteotomy. Finally, in those patients with flexible recurrent subluxation in whom the talus is easily reduced and the equinus quickly corrected, a procedure such as transfer of the anterior tibial tendon laterally might preclude prolonged immobilization in a cast or brace.

SUMMARY

Talar subluxation occurs in all types of equinovarus clubfoot and seems to be of clinical significance, principally in the persistent type, although it is frequently observed in the recurrent type. It may be suspected clinically when a manually correctable heel varus recurs on weight bearing. It is verified by roentgenographic evidence of a decreased talocalcaneal angle with lateral displacement of the head of the talus.

Armed Services Medical Regulating Office

Byron L. Steger, *Colonel, MC, U. S. A.* (1)

Donald E. Domina, *Major, MSC, U. S. A.* (1)

WHEN a wounded or sick soldier, marine, airman, or sailor arrives in the continental United States, there are two important questions on his mind: (1) "How close to home are you going to get me?" and (2) "When can I get some money?" In the latter, the Armed Services Medical Regulating Office (ASMRO) plays no role but in the former, it is the key agency and is only too willing to furnish a prompt answer. Without his knowledge the movement of the average patient from the front-line aid station to the port of debarkation in the continental United States and, subsequently, to a hospital for definitive treatment has been made according to a carefully-devised plan based on the many lessons in evacuation that former wars have taught. It is with the final phase of this movement that ASMRO is primarily concerned, yet to direct this final phase efficiently, ASMRO has a concomitant interest in the entire chain of evacuation.

One of Webster's definitions for the term regulate is "To reduce to order, method, or uniformity; to regularize." In the accomplishment of its mission ASMRO uses many tools. The basic essentials are the patient, the mode of conveyance, the hospital bed, and speedy communication. Although all wars have created certain problems concerned with patient movement and control, these problems prior to World Was II were relatively simple. The clear-cut requirement for getting the patient to a hospital having adequate facilities for a particular type of specialized treatment became clear in World War II. Because the number of specialists was insufficient to permit wide-spread activities, it became necessary to concentrate the professional potential and bring the patient to the appropriate physician. This requirement coupled with a transport system that had continually increased its speed and efficiency created a need for centralized control of patient movement which was fully recognized in 1943.

(1) Armed Services Medical Regulating Office, Washington, D. C.

A centralized control system which became known as "medical regulating" was devised by the Army Surgeon General. This system worked effectively to bring about completely-coordinated patient evacuation. From the processing of a few thousand Army and Air Corps patients in the early stages of its development, the Medical Regulating Office reached peak performance in May 1945 when it regulated the flow of nearly 60,000 patients into military hospitals in the continental United States.

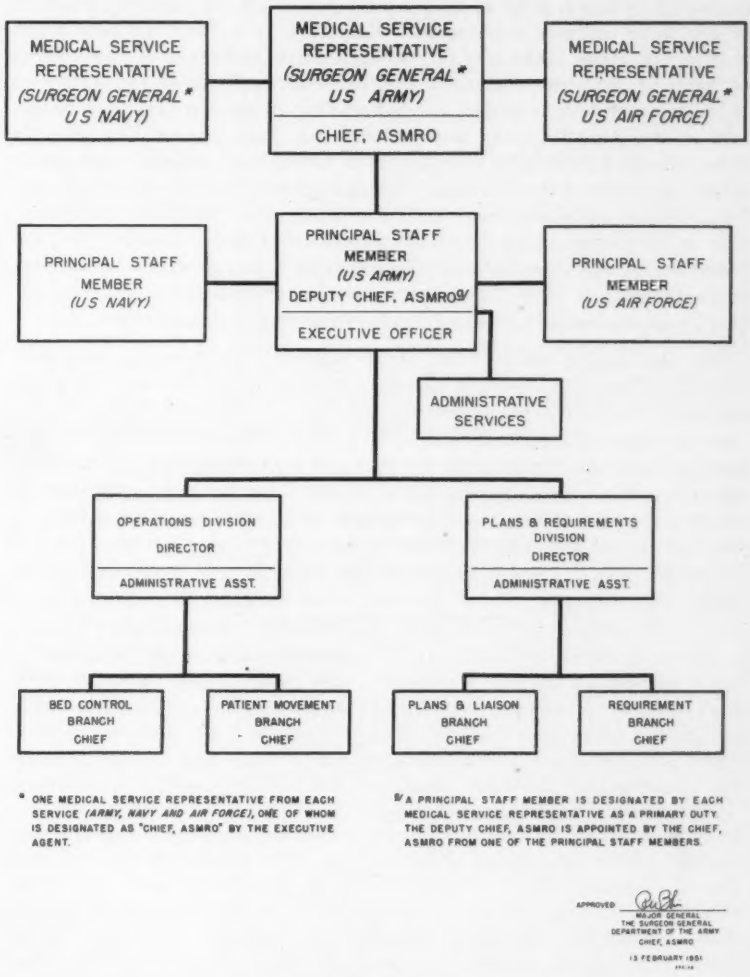
Between August 1945 and the outbreak of hostilities in Korea, the work of this agency continued. Constant study was undertaken to improve the system; to make better use of medical facilities and, from the patient's viewpoint, to smooth out many of the details connected with the patient's movement. Rail and water were the chief means used for the transportation of patients during World War II. As the war progressed, however, air evacuation to the continental United States, became more and more popular, gradually replacing most of the commoner modes of transportation. In the fall of 1949, the Secretary of Defense announced a policy calling for the use of aircraft in the evacuation of all patients dependent only on aircraft availability and appropriate medical indications. Implementation of this policy brought about the lay-up of the last two active U. S. Army ambulance ships, U. S. S. *Hope* and U. S. S. *Comfort*. The Hospital Train Unit at Letterman Army Hospital and the Hospital Train Detachment at Camp Kilmer, N. J., also became inactive. As a result the percent of patients returned to the continental United States by air increased from 30 in 1945 to about 98 in 1951.

During this transition period a study was undertaken to bring about a joint Army-Navy-Air Force, medical regulating office. Early studies of the Department of the Army pertaining to medical regulating activities served as the embryo from which the present ASMRO was formed. After more than a year of analysis and rewriting, conclusions were presented to the Joint Logistics Plans Committee, which delved further into all problems, resolved differences of opinion that arose from within the three services, and submitted a charter to the Joint Chiefs of Staff. On 25 October 1950, the Secretary of Defense approved the charter. It was then forwarded to the Secretaries of the three Departments for implementation. ASMRO thus evolved and was established as a joint operating office in December 1950 under the Chief of Staff, U. S. Army, as Executive Agent for the Joint Chiefs of Staff.

In organization and in spirit, it is truly a joint office (fig. 1). The office staff is comprised of commissioned officers from the three services, U. S. Navy hospital corpsmen, and civilian employees. The charter outlines in detail the functions and responsibilities of the Chief, ASMRO. In brief, these functions and responsibilities cover (1) the obtaining of necessary bed availability reports from medical facilities of the Armed Forces; (2) the control of the flow of patients; (3) the development of adequate liaison with transport agencies; (4) the collection and analysis of medical evacuation requirements; (5) the development

ORGANIZATIONAL CHART

ARMED SERVICES MEDICAL REGULATING OFFICE



* ONE MEDICAL SERVICE REPRESENTATIVE FROM EACH SERVICE (*ARMY, NAVY AND AIR FORCE*), ONE OF WHOM IS DESIGNATED AS "CHIEF, ASMRO" BY THE EXECUTIVE AGENT.

1/ A PRINCIPAL STAFF MEMBER IS DESIGNATED BY EACH MEDICAL SERVICE REPRESENTATIVE AS A PRIMARY DUTY. THE DEPUTY CHIEF, ASMRO IS APPOINTED BY THE CHIEF, ASMRO FROM ONE OF THE PRINCIPAL STAFF MEMBERS.

APPROVED
MAJOR GENERAL
THE SURGEON GENERAL
DEPARTMENT OF THE ARMY
CHIEF, ASMRO
13 FEBRUARY 1951

Figure 1.

of appropriate plans to improve patient evacuation procedures; and (6) the initiation of recommendations on doctrine and policy procedures to be followed in the issuance of patient-movement directives.

On 1 April 1951, the Department of the Navy issued appropriate directives which brought the flow of naval and marine patients under ASMRO cognizance.

ASMRO is a patient-movement-control agency, and not an agency formed to impress medical operational policy on the medical services of the three military departments. Rather, it is a joint military office working in close liaison with the operations personnel of the offices of each of the three Surgeons General and each transport agency in order that a steady, uniform, controlled flow of patients into the hospitals of the Armed Forces may be effected. This control has recently been extended to include the movement of military patients into appropriate hospitals of the Veterans' Administration. Properly to effect complete patient movement control, efficient use of all media of transportation is necessary. This facet of operations is being covered by complete liaison with the Chief of Transportation, Department of the Army, and through him, with the Military Air Transport Service, the Military Sea Transport Service, and the Association of American Railroads.

For the future, ASMRO has many projects. Recommendations pertaining to the entire field of patient-movement directives are being formulated. The problems inherent in prompt and efficient communication from debarkation hospitals to ASMRO are to be studied. Standardization and improvement in the entire field of patient debarkation and processing are needed. Mobilization plans of the three services pertaining to patient evacuation are to be reviewed. Additional standardization, in the interest of the most economical use of the total military hospital potential, will be sought in connection with medical regulating activities.

About the Army Medical Service

The New Army Interns and Residents

Charles H. Gingles, *Colonel, MC, U. S. A.* (1)

ON 1 July 1951, 137 interns and 73 residents who were selected by the Department of the Army for entry into or continuance in professional training commenced that training in named Army hospitals. As in past years, the selection of the interns was effected by a committee designated by the Surgeon General for that purpose, and the selection of residents was accomplished by the Professional Education Committee of the Office of the Surgeon General.

This year 520 applicants representing 60 medical schools approved by the American Medical Association were considered for the internship appointments. Because of the limited number of internships available, it was not possible to approve all of these even though many of those who were not selected unquestionably would have contributed materially to the Army Medical Service. In the selection of interns, special consideration was given to those applicants who either were enrolled in the Medical Reserve Officers Training Corps program, or were veterans, and to those who indicated a sincere interest in a military medical career. Selected applicants were tendered appointments in accordance with the Cooperative Plan for Appointment of Interns, as adopted by the Association of American Medical Colleges, the American Medical Association, the American Hospital Association, the American Protestant Hospital Association, and the American Catholic Hospital Association. Those who accepted and subsequently commenced their internship training were appointed first lieutenants in the Medical Corps Reserve. As officers on active duty, they will receive the pay and allowances of that grade during their training period. Analysis of the background of the new Army interns reveals that 115 had prior military service; 7 held commissions in the Medical Service Corps; 36 others held Reserve commissions in the Navy, Air Force, and National Guard or other corps of the Army Reserve. Two of the new interns had

(1) Personnel Division, Office of the Surgeon General, Department of the Army.

advanced to the grade of major and 14 others to the grade of captain. All in all, it may be seen that this year's interns are military men and officers of whom the Army Medical Service can be proud.

The training these interns will receive is being conducted in 11 named Army hospitals. Seven of these hospitals (Brooke Army Hospitak, San Antonio, Tex.; Fitzsimons Army Hospital, Denver, Colo.; Letterman Army Hospital, San Francisco, Calif.; Madigan Army Hospital, Tacoma, Wash.; Tripler Army Hospital, Honolulu, T. H.; Walter Reed Army Hospital, Washington, D. C.; and William Beaumont Army Hospital, Fort Bliss, Tex.) conducted internship training programs during the past year. This year internship training is also being conducted at Army and Navy General Hospital, Hot Springs, Ark.; Murphy Army Hospital, Waltham, Mass.; Percy Jones Army Hospital, Battle Creek, Mich.; and Valley Forge Army Hospital, Phoenixville, Pa.

The Army intern trainipg program has been so designed that it fully meets the requirements of the Council on Medical Education and Hospitals of the American Medical Association. It is executed under the direction of physicians, both military and civilian, who are outstanding professionally and eminently qualified as teachers. The program utilizes modern fully equipped laboratories and medical, surgical, and radiologic facilities. Each of the teaching hospitals possesses abundant and varied clinical material which permits excellent training opportunities. The internships are of the rotating type, and will afford to all participants a well-rounded exposition to the field of military medicine. In general, the duties of the intern will correspond to those performed in civilian hospitals, and there will be ample opportunity for the discussion of problems as they present themselves.

In the past, the Army interns have constituted a sizeable percentage of those officers commissioned into the Regular Army. It is hoped this year that the comparable percentage will be the highest ever. This optimism is based on the fact that this is the first group of military interns who as a group will serve on active duty at least one year immediately after their internship training. This specified period of service has been introduced as the result of an agreement between the armed services which was incorporated as a policy of the Secretary of Defense. It is believed that this greater period of participation in military medical activities will better acquaint these new medical officers with the opportunities afforded by a career in Army medicine.

To those who desire to apply for Regular Army appointment at the earliest date, the opportunity will be extended after they complete 8 months of training. The commanding officer at their hospital will tender them this opportunity and he will be readily available to furnish any information and guidance the intern might desire. Time and experience alone will determine how well-founded is this optimism.

The number of residents who were selected for entry into or continuance in professional training this year was less than usual because

the Army Medical Service is fulfilling its commitment to those officers whose training was temporarily interrupted by service in the Korean war. These officers were permitted to re-enter their residencies with the knowledge that the Army Medical Service is truly proud of their performance.

Those officers who were selected for training this year met the criteria established in a policy of the Secretary of Defense. Under this policy, primary consideration was given to those Regular Army officers who had completed at least 2 years of commissioned service subsequent to their internship. Officers serving in all parts of the world were considered, and those selected who were serving overseas were returned to the United States in time to commence their training on 1 July. The controlling factor was not, however, the amount of commissioned service but rather the manner of performance of duty and the number to be selected for training in a given specialty.

Certain of the officers selected for residency training had only recently completed their internships but others had up to 8 years of military service, including duty in other branches. Here, again, as in the intern program, it may be seen that military men who manifested an interest in a military medical career comprised the training personnel. The training this year's newly selected residents will receive is being conducted in four named Army hospitals: Brooke, Fitzsimons, Letterman, and Walter Reed. The training program has been so designed that the training in each specialty is fully creditable toward attaining certification by an appropriate American specialty board. This training, like the internship training program, is conducted by military and civilian physicians eminently qualified in their fields. The nature of the facilities in which the residents train and the quality of the available clinical material assures the resident an opportunity to attain the knowledge and proficiency desired.

It is hoped that it will not be necessary to interrupt the training of residents this year for duty overseas. It is also hoped that the coming years will permit a greater number to be selected for professional training. It is significant, though, that most of the officers whose training was interrupted last year, and who acquired experience overseas, returned to training with a much more mature outlook than they had when they left. Consequently, they should be better able to benefit from their training. This was particularly true of the officers who served with troops in combat. Many of the officers selected for training this year are also fortunate in having had similar experience.

It should be understood that our medical officers in professional training are military men—men who have demonstrated by military service that they desire to contribute to the advancement of the Army Medical Corps. A list of the officers selected as interns and residents for training this year follows. We all wish them continued success in their military medical career.

957406 O - 51 - 8

TABLE 1.—*Army interns*

Name	Medical school	Hospital of internship
Abrahamsen, Edwin H.	Jefferson Medical College	Valley Forge
Agnew, Paul C.	McGill University	Madigan
Aiken, Robert E.	University of Southern California	Tripler
Akers, Joseph D.	University of Illinois	Fitzsimons
Aller, Leeon Jr.	University of Pennsylvania	Madigan
Anderson, Robert V.	Jefferson Medical College	Walter Reed
Auerswald, Edgar H.	University of Wisconsin	Tripler
Ayerle, Robert S.	University of Pennsylvania	Walter Reed
Babim, Silas, Jr.	Louisiana State University	Walter Reed
Bailey, Henry W.	University of Georgia	Brooke
Best, Andrew A.	Meharry Medical College	Madigan
Betts, Charles S.	Vanderbilt University	Brooke
Brasher, Burton F.	University of Utah	Tripler
Brown, Kennell P.	Tulane University	Brooke
Burkhalter, Ewell R.	Louisiana State University	Brooke
Callas, Stanley D.	University of Oregon	Valley Forge
Caswall, Thomas M.	Western Reserve University	Tripler
Caudle, Harold V.	State University of Iowa	Letterman
Chan, Wallace L.	Stanford University	Tripler
Claypool, Harry A.	Western Reserve University	Brooke
Clements, Richard O.	Baylor University	Brooke
Coates, Bradley T.	Syracuse University	Tripler
Cone, William H.	University of Oregon	William Beaumont
Connolly, John R.	Loyola University	Fitzsimons
Cooper, David S.	Columbia University	Brooke
Coury, Paul E.	Western Reserve University	Madigan
Cupp, Claude M.	Emory University	Tripler
Cureton, Jerald R.	Tulane University	Fitzsimons
Cutshall, Vincent K.	University of Colorado	Fitzsimons
Davis, Thomas D.	Louisiana State University	Valley Forge
Davis, William E.	Columbia University	William Beaumont
DeMarais, Francis E.	University of Minnesota	Tripler
Denney, Ernest E.	Emory University	Percy Jones
Doerr, Alphonsus L.	Loyola University	Walter Reed
Edwards, George D.	Georgetown University	Letterman
Ellis, Jacob P.	University of Arkansas	Walter Reed
Evilsizer, Thomas S., Jr.	University of Kansas	Madigan
Feighny, Robert E.	University of Kansas	Brooke
Ferry, Francis A.	St. Louis University	Madigan
Fischer, Barton L.	University of Kansas	Tripler
Foley, George P.	Tufts College	Letterman
Fountain, Freeman P.	University of Colorado	Fitzsimons
Gibbs, Raymond W.	New York Medical College	Walter Reed
Glover, Daniel H. G.	University of Georgia	Letterman
Goodman, Lowell I.	Yale University	Percy Jones
Goodman, Raymond C.	University of Arkansas	William Beaumont
Green, George F.	University of Georgia	Brooke
Gremmel, Gilbert C.	University of Texas	Brooke
Hardie, Philip W., Jr.	University of Wisconsin	Tripler
Hartley, Thomas F.	University of Arkansas	Madigan
Hauser, Charles F.	Jefferson Medical College	Walter Reed
Hayes, David	Harvard Medical College	Walter Reed

TABLE 1.—*Army interns*—Continued

Name	Medical school	Hospital of internship
Hayes, Donald M.	Syracuse University	Walter Reed
Henriques, Charles C.	University of Oregon	Brooke
Hooper, Curtis C., Jr.	Baylor University	Letterman
Horne, Francis G.	Duke University	Brooke
Houck, Leroy R.	University of Michigan	Murphy
Howard, William R.	Emory University	Brooke
Hudson, George C.	Baylor University	Brooke
Hurdle, John F.	University of Colorado	Letterman
Jones, Wilton N.	University of Oklahoma	Letterman
Kitchens, Darriel G., Jr.	University of Georgia	Army & Navy
Krueger, Harold P.	University of Buffalo	Walter Reed
Lardinois, Clifford C.	University of Wisconsin	Brooke
LeBeau, George L.	Louisiana State University	William Beaumont
Lee, Philip J. W.	Creighton Medical School	Walter Reed
Leigh, Bert G.	University of Illinois	Letterman
Leonard, Glenn R.	Jefferson Medical College	Fitzsimons
Leopold, Jonathan P. A.	University of Buffalo	Walter Reed
Leroy, Alvin G.	Loyola University	Fitzsimons
Lewis, Robert L.	University of Arkansas	Army & Navy
Locke, Robert V.	Syracuse University	Walter Reed
Mainor, Robert	University of Georgia	Madigan
Martin, Raymond G.	University of Oregon	Madigan
Mattingly, Thomas E., Jr.	George Washington University	Walter Reed
McMillion, Stephen D.	University of Arkansas	Army & Navy
McCaleb, Foster C., Jr.	Tulane University	Walter Reed
McKeown, Eugene P.	Georgetown University	Walter Reed
Mengis, Christopher L.	Tulane University	Madigan
Mitchell, John P., Jr.	Tulane University	Brooke
Monk, Benjamin F., Jr.	Baylor University	Madigan
Mortenson, Howard O.	University of Minnesota	Tripler
Nakashima, Donald T.	University of Nebraska	Tripler
Nash, Dearing A.	University of Georgia	Brooke
Nilan, John E.	Syracuse University	Fitzsimons
Onstead, Charles O., Jr.	Southwestern Medical College	Brooke
Page, Merle C.	University of Michigan	Fitzsimons
Pampid, Nicholas V.	Duke University	William Beaumont
Peltason, Walter C.	Wayne University	Murphy
Power, John R.	University of Arkansas	Army & Navy
Railsback, George, Jr.	Baylor University	Brooke
Ratchford, Lawrence A.	St. Louis University	Fitzsimons
Read, Allen M.	Tulane University	Letterman
Richardson, James P.	Temple University	Walter Reed
Richardson, William W.	Tulane University	William Beaumont
Roberts, Grosvenor G.	University of Kansas	Letterman
Robertson, William D.	University of California	Letterman
Ryder, Gilbert S.	University of Nebraska	Madigan
Sawyer, William C., Jr.	University of Oklahoma	Letterman
Schoonmaker, Joseph H.	University of Colorado	Tripler
Schwartz, Mervin L.	Temple University	Fitzsimons
Sebastian, Eugene	Temple University	Murphy
Seifert, Thomas E.	University of Pittsburgh	Walter Reed
Shankel, Lewis W.	University of Virginia	William Beaumont

TABLE 1.—*Army interns*—Continued

Name	Medical school	Hospital of internship
Sheehy, Thomas W.	Syracuse University	Brooke
Shrader, Harold E.	Baylor University	Brooke
Sieger, Joseph P.	Temple University	Fitzsimons
Silman, James B.	Baylor University	Letterman
Silverberg, Joseph E.	Tufts College	Murphy
Simmons, James C.	University of Arkansas	Walter Reed
Simons, Charles E.	University of Washington	Madigan
Slaughter, Manuel O.	University of Arkansas	William Beaumont
Slominksi, Victor J.	Wayne University	Percy Jones
Smith, Joe C.	Baylor University	Brooke
Socha, Eugene M.	Marquette University	Percy Jones
Swain, Edward B.	Cornell University	Walter Reed
Stearns, Perry O.	Boston University	Fitzsimons
Sucsy, Robert W.	State University of New York	Fitzsimons
Sweeney, Vincent C.	University of Oregon	Letterman
Thicksten, Jack N.	University of Arkansas	Madigan
Tidd, Harmon O.	Western Reserve University	Brooke
Tiller, Ralph E.	Tulane University	Fitzsimons
Toland, William J.	University of Arkansas	Walter Reed
Tolleson, William J.	University of Arkansas	Brooke
Turner, Harold T.	Medical College of Virginia	Brooke
Turner, John C.	Tulane University	Walter Reed
Uhrig, Henry T.	New York Medical College	Valley Forge
VanLeeuwen, Nicholas W.	Columbia University	Walter Reed
Walker, William W.	Emory University	Fitzsimons
Walton, Spencer	Tulane University	Madigan
White, Eugene L.	University of Minnesota	Tripler
Wilbourne, George R.	Baylor University	Brooke
Williams, Harold L.	Duke University	William Beaumont
Williams, Louis H.	Duke University	William Beaumont
Yeary, Robert A.	University of Texas	William Beaumont
Yount, Arthur W.	Bowman Gray	Letterman
Zerzan, Charles J., Jr.	Marquette University	Madigan

TABLE 2.—*Army residents*

Specialty	Army hospitals							
	Brooke		Fitzsimons		Letterman		Walter Reed	
	Name	Training level	Name	Training level	Name	Training level	Name	Training level
Anesthesia	Creppa, Captain William F.	AR					Barila, Lieutenant Timothy G.	AR
Cardiology					Franklin, Major Robert B.	SR	Orbison, Lieutenant Colonel James A.	SR
Dermatology	Kuhl, Captain Ivan W.	SR					Harman, Captain Louis E., Jr.	AR
General surgery	Henderson, Major Warren	AR			Hopeman, Lieutenant Alan R. Castagno, Major Americo J. Walsh, Captain Richard A.	AR R R	Strand, Major Donald J.	AR
Internal medicine	Ewart, Lieutenant James A.	AR			Langsjoen, Lieutenant P. H. Taylor, Captain Richard R.	AR R	Mott, Captain Loran E. Syner, Lieutenant James C. Green, Lieutenant Robert W. Scott, Major Norman M.	AR AR AR R
Obstetrics and gynecology	Nicholson, Major Robert W.	R					Sherman, Captain Robert L.	R
Ophthalmology	Passmore, Major Jack W.	AR					Levi, Lieutenant George A.	AR
Orthopedics	Phippen, Captain William G. Van Osdel, Lieutenant Lewis A. Ward, Captain Richard A. Ljunggren, Captain John F. Lockwood, Major Robert S.	AR AR AR R SR	Walker, Major Keith A.	AR	Brown, Lieutenant Paul W. Sellers, Lieutenant Thomas D.	AR AR	Coffey, Major John J. Barnett, Major Robert J. Parmenter, Captain Robert E.	AR AR AR
Otolaryngology	Webb, Captain John H., Jr. Joseph, Captain Donald J.	R R			Sheehy, Lieutenant James L.	AR	Cox, Captain Lawson G. Harcourt, Captain Frederick L. Peisel, Captain Francis J.	AR R R

TABLE 2.—*Army residents—Continued*

Specialty	Army hospital							
	Brooke		Fitzsimons		Letterman		Walter Reed	
	Name	Training level	Name	Training level	Name	Training level	Name	Training level
Pathology	Kellenberger, Lieutenant Robert E. Bosman, Lieutenant Robert I. Mason, Captain John W. Ranson, Captain Robert F.	AR R CR CR	Lincoln, Major Arthur F. Brosius, Captain Otto C.	R R	Berry, Major Lorenzo R. Glassy, Captain Frank J.	R CR	Metzger, Lieutenant Joseph F.	AR
Pediatrics	Martin, Captain Francis P.	R			Giffen, Captain Robert B., Jr.	AR		
Physical medicine					Shafer, Lieutenant James A.	AR	Vultee, Lieutenant Frederick E., Jr.	AR
Psychiatry			Geiger, Lieutenant Hugh S. Mizell, Lieutenant Walter S. Finn, Lieutenant Murray E. Finch, Major Charles, Jr. Clarke, Captain Thomas P., III Counts, Captain Robert M.	AR AR AR SR SR SR	Artiss, Major Kenneth L. Bushard, Major Bruce L. Houck, Captain George W.	AR AR AR	Leddy, Major Donald V. Johnson, Captain Arnold W. Parrish, Lieutenant Mathew D. Washburn, Captain Lawrence L. Glasscock, Captain Thomas T. Dale, Captain Paul W. Simenson, Captain Robert A. Smith, Captain Charles B. Weinland, Captain George C.	AR AR AR R R SR SR SR SR
Radiology					Seitz, Captain Ernest R.	SR	Obourn, Lieutenant Robert L. Morris, Lieutenant John De L. S.	AR AR

AR=Assistant resident—first year training level.
R=Resident—second year training level.
SR=Senior resident—third year training level.
CR=Chief resident—fourth year training level.

BOOKS RECEIVED

Gynecologic Cancer, by *James A. Corscaden*, Ph. B., M. D., Professor Emeritus of Clinical Gynecology, College of Physicians and Surgeons, Columbia University; Attending Gynecologist, Sloane Hospital for Women, New York, N. Y. Thomas Nelson & Sons, New York, N. Y., publisher, 1951. Price $6.

Symposium on Steroids in Experimental and Clinical Practice, edited for the *Committee on Arrangements*, by *Abraham White*. 415 pages; illustrated. The Blakiston Co., Philadelphia, Pa., publisher, 1951. Price $7.50.

Clinical Tropical Medicine, *R. B. H. Gradwohl*, M. D., Editor-in-Chief; *Luis Benitez Soto*, M. D., and *Oscar Felsenfeld*, M. D., Editors. 1647 pages; 473 illustrations and 6 color plates. The C. V. Mosby Company, St. Louis, Mo., publisher, 1951. Price $22.50.

Human Physiology, by *Bernardo A. Houssay*, M. D., Professor of Physiology, Director of the Institute of Biology and Experimental Medicine, Buenos Aires, Argentina; *Juan T. Lewis*, M. D., Professor of Physiology, Director of the Institute for Medical Research, Rosario, Argentina; *Oscar Orías*, M. D., Professor of Physiology; Director of the Mercedes and Martín Ferreyra Institute for Medical Research, Córdoba, Argentina; *Eduardo Braun Menendez*, M. D., Professor of Physiology, Member of the Institute of Biology and Experimental Medicine, Buenos Aires, Argentina; *Enrique Hug*, M. D., Professor of Pharmacology of the School of Medicine, Rosario, Argentina; *Virgilio G. Foglia*, M. D., Professor of Physiology, Member of the Institute of Biology and Experimental Medicine, Buenos Aires, Argentina; and *Luis F. Lelois*, M. D., Director of the Institute for Biochemical Research, Campomar Foundation, Buenos Aires, Argentina. Translated by *Juan T. Lewis*, M. D., and *Olive T. Lewis*, with a foreword by *Herbert M. Evans*, M. D. 1117 pages; illustrated. McGraw-Hill Book Co., Inc., New York, N. Y., publisher, 1951. Price $14.

The 1950 Year Book of Physical Medicine and Rehabilitation (December 1949-January 1951), edited by *Frank H. Krusen*, M. D., Professor of Physical Medicine, Mayo Foundation; Head of the Section on Physical Medicine and Rehabilitation, Mayo Clinic; Associate Editors; *Earl C. Elkins*, M. D., Assistant Professor of Physical Medicine, Mayo Foundation; Consultant in Physical Medicine and Rehabilitation, Mayo Clinic, and *George G. Deaver*, M. D., Professor of Clinical Rehabilitation and Physical Medicine, New York University College of Medicine; Director of the Department of Physical Medicine and Rehabilitation, Bellevue Hospital. 328 pages; illustrated. The Year Book Publishers, Inc., Chicago, Ill., publisher, 1951. Price $5.

Hypnoidal Psychotherapy, by *Margaret Steger*, Ph. D., Foreword by *Frederic Bergstrom*, M. D. 150 pages. Froben Press, Inc., New York, N. Y., publisher, 1951. Price $3.50.

Diseases of the Heart and Circulation, by *Paul Wood*, O. B. E., M. D. (Melboume), F. R. C. P. (London), Director, Institute of Cardiology, London; Physician, National Heart Hospital; Physician in charge of the Cardiac Department, Brompton Hospital; Cardiologist, Rheumatic Fever Unit, Canadian Red Cross Memorial Hospital, Taplow; Late Consulting Cardiologist, Postgraduate Medical School of London, Hammersmith Hospital. 589 pages; illustrated. J. B. Lippincott Co., Philadelphia, Pa., publishers, 1950. Price $12.50.

A Textbook of Medicine, edited by *Russell L. Cecil*, M. D., Sc. D., Professor of Clinical Medicine Emeritus, Cornell University, New York, and *Robert F. Loeb*, M. D., Bard Professor of Medicine, Columbia University, New York. Associate editors, *Alexander B. Gutman*, M. D., Professor of Medicine, Columbia University, New York; *Walsh McDermott*, M. D., Associate Professor of Medicine, Cornell University, New York, and *Harold G. Wolff*, M. D., Associate Professor of Medicine (Neurology), Cornell University. 8th edition. 1627 pages; illustrated. W. B. Saunders Co., Philadelphia, Pa., publishers, 1951. Price $12.

Clinical Heart Disease, by *Samuel A. Levine*, M. D., F. A. C. P., Clinical Professor of Medicine, Harvard Medical School; Physician, the Peter Bent Brigham Hospital, Boston; Consultant Cardiologist, Newton-Wellesley Hospital; Physician, New England Baptist Hospital. 4th edition. 556 pages; illustrated. W. B. Saunders Co., Philadelphia, Pa., publishers, 1951. Price $7.75.

Oral Physiology, by *John T. O'Rourke*, B. S., D. D. S., Sc. D. Edited by *Leroy M. S, Miner*, M. D., D. M. D., Sc. D., Dr. P. H., Boston. 333 pages. The C. V. Mosby Co., St. Louis, Mo., publisher, 1951. Price $5.

A History of Neurological Surgery, edited by *A. Earl Walker*, M. D., Professor of Neurological Surgery, The Johns Hopkins University. Contributors: *William J. Atkinson, Kenneth M. Browne, John V. Crawford, Robert G. Fisher, Robert E. Green, Herbert C. Johnson, James Markham, Curtis Marshall, Desmond C. O'Connor, W. Eugene Stern, Alfredo F. Thomson, A. Earl Walker.* Editorial Committee: *Robert E. Green, Herbert C. Johnson, W. Eugene Stern.* 583 pages; illustrated. The Williams & Wilkins Co., Baltimore, Md., publisher, 1951. Price $12.

Oral Rehabilitation, Complete Occlusal Reconstruction, Treatment of Dental Deformities and Related Subjects, The Closed Bite, by *Jerome M. Schweitzer*, B. S., D. D. S., Consulting Dental Surgeon, Woman's Hospital, New York City; Postgraduate Instructor in Prosthetics, First District Dental Society, New York City; Associate Fellow New York Academy of Medicine; Fellow American Academy of Dental Medicine. 1161 pages, with 1157 illustrations. The C. V. Mosby Co., St. Louis, Mo., publisher, 1951. Price $20.

A Text-Book of X-ray Diagnosis, by British Authors, in Four Volumes. Edited by *S. Cochrane Shanks*, M. D., F. R. C. P., F. F. R., Director, X-ray Diagnostic Department, University College Hospital, London, and *Peter Kerley*, M. D., F. R. C. P., F. F. R., D. M. R. E., Director, X-ray Department, Westminster Hospital, Radiologist, Royal Chest Hospital, London. 2d edition, Volume II. 702 pages; 605 illustrations. W. B. Saunders Co., Philadelphia, Pa., publishers, 1951. Price $15.

Clinical Electrocardiography, by *Ashton Graybiel*, Captain, MC, USN, Director of Research, U. S. Naval School of Aviation Medicine, Pensacola, Fla. 198 pages; illustrated. Thomas Nelson & Sons, New York, N. Y., publisher, 1951. Price $5.

Anesthesia in Dental Surgery, by *Sterling V. Mead*, D. D. S., M. S., B. S., F. A. C. D. 2d edition. 648 pages, with 212 illustrations. The C. V. Mosby Co., St. Louis, Mo., publisher, 1951. Price $12.50.

Clinical Laboratory Methods, by *W. E. Bray*, B. A., M. D., Professor of Clinical Pathology, University of Virginia, Director of Clinical Laboratories, University of Virginia Hospital. 4th edition. 614 pages, with 119 text illustrations and 18 color plates. The C. V. Mosby Co., St. Louis, Mo., publisher, 1951. Price $7.25.

Diabetes Insipidus, by *Harry Blotner*, M. D., Associate Visiting Physician, Beth Israel Hospital, Boston, Mass. Edited by *Henry A. Christian*, A. M., M. D., LL. D., Sc. D. (Hon.), M. A. C. P., Hon. F. R. C.P. (Can.), D. S. M. (A. M. A.), Hersey Professor of the Theory and Practice of Physic, Emeritus, Harvard University; Sometime Clinical Professor of Medicine, Tufts College Medical School; Sometimes Visiting Physician, Beth Israel Hospital; Sometime Physician-in-Chief, Emeritus, Peter Bent Brigham Hospital, Boston, Mass. (Reprinted from Oxford Loose-Leaf Medicine with the same page numbers as in that work.) 206 pages; illustrated. Oxford University Press, New York, N. Y., publisher, 1951. Price $4.50.

Handbook of Nutrition, A Symposium, prepared under the auspices of the *Council on Foods and Nutrition of the American Medical Association.* 2d edition. 717 pages. Published for American Medical Association. The Blakiston Co., Philadelphia, Pa., publisher, 1951. Price $4.50.

Emotional Factors in Cardiovascular Disease, by *Edward Weiss*, M. D., Professor of Clinical Medicine, Temple University School of Medicine, Philadelphia, Pa. Publication Number 97, American Lecture Series. A Monograph in American Lectures in Circulation. 84 pages. Charles C Thomas, Publisher, Springfield, Ill., 1951. Price $2.25.

Syllabus of Human Neoplasms, by *R. M. Mulligan*, M. D., Professor of Pathology in the University of Colorado School of Medicine. 317 pages, with 230 illustrations. Lea & Febiger, Philadelphia, Pa., publisher, 1951. Price $7.50.

The 1950 Year Book of Endocrinology (January 1950-January 1951), edited by *Willard O. Thompson*, M. D., Clinical Professor of Medicine; University of Illinois College of Medicine; Attending Physician (Senior Staff), Henrotin Hospital; Attending Physician, Grant Hospital of Chicago. 499 pages; illustrated. The Year Book Publishers, Inc., Chicago, Ill., publisher, 1951. Price $5.

The Bender-Gestalt Test, Quantification and Validity for Adults, by *Gerald R. Pascal*, Ph. D., Research Psychologist, Western Psychiatric Institute and Clinic; Associate Professor of Psychology, University of Pittsburgh, and *Barbara J. Suttell*, M. S., Associate Research Psychologist, Western Psychiatric Institute and Clinic. Foreword by *David G. Wright*, M. D. 274 pages; illustrated. Grune & Stratton, New York, N. Y., publisher, 1951. Price $6.50.

Post-Graduate Lectures on Orthopedic Diagnosis and Indications, by *Arthur Steindler*, M. D., F. A. C. S., Professor of Orthopedic Surgery, State University of Iowa, Iowa City, Ia. Volume II, Section A: Paralytic Disabilities; Section B: Static Disabilities. 198 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1951. Price $6.

Ambulation, Physical Rehabilitation for Crutch Walkers, by *Kenneth A. Dening*, B. S., M. Ed., and *Frank S. Deyoe*, Jr., B. S., Instructor-Supervisors, Corrective Therapy, Cushing Veterans Administration Hospital, Framingham, Corrective Therapists at Boston City Hospital, Boston, and Medford Ambulation Clinic at Medford, in Massachusetts, and *Alfred B. Ellison*, B. S., Chief, Corrective Therapy, Cushing Veterans' Administration Hospital, Framingham, Corrective Therapist at Boston City Hospital, Boston, and Medford Ambulation Clinic at Medford in Massachusetts. 188 pages; illustrated. Funk and Wagnalls Co., New York, N. Y., publisher, 1951. Price $3.50.

BOOK REVIEWS

The Ethical Basis of Medical Practice, by *Willard L. Sperry*, Dean of the Harvard Divinity School, with a foreword by *J. Howard Means*, M. D. 185 pages. Paul B. Hoeber, Inc., New York, N. Y., publishers, 1950. Price $2.50.

Dean Sperry very capably attempts to marry medicine and theology. Although from the medical viewpoint this is proper, it is still difficult for the physician to forget the centuries during the dark ages when he had to accomplish his researches in dark cellars and cold attics, fearful that the powerful political forces of religious bodies might catch him in the act of studying human anatomy on a dead body. For such an offence he might be tortured on the rack and killed. Although after 500 years we are still wary of overtures from religious sources, we recognize the need in all humanity for the doctor and the minister. These needs overlap. Both professions could do better work through mutual trust and cooperation. The question that I do not feel capable of answering is how to develop the cooperation and annihilate the distrust. Dean Sperry develops this thesis. I spent 5 months reading the first 75 pages of this book yet I read and reread the last 100 pages in one night. I would suggest that any doctor who reads this book read Chapter 8 first in order to get interested. He will then study the rest of this serious work of a learned man. It is not for the casual reader, but should be read by any who aspire to leadership in medicine.

—*Commander W. F. Lyons, MC, U. S. N.*

Essentials of Urology, by *J. C. Ainsworth-Davis*, M. A., M. D., B. CH. (Cant.), F. R. C. S. (Eng. and Edin.), Urological Surgeon, The Bolingbroke Hospital, London; Visiting Urologist, Kettering and District General Hospital and the Lord Mayor Treloar's Hospital, Alton; Hon. Consulting Urologist, Royal Waterloo Hospital, London; Late Wing-Commander i/c Surgical Division, Royal Air Force Medical Services; Secretary to Council, Royal Society of Medicine. 734 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1950. Price $10.

This clear, concise textbook contains few drawings, but those which have been included are excellent. It reflects the author's wide experience in military as well as civilian practice. The discussion of the treatment of bladder and renal injuries is excellent. There may be some criticism of the evaluation of aberrant renal vessels and the treatment of hydronephrosis. Sections on the clinical diagnosis of urologic lesions are thorough and complete. For a one-volume text, the discussion of radiography and operative procedures is detailed and excellent, but there is little discussion of basic physiology, metabolism, and endocrinology as applied to urology or urologic conditions in children. Early postoperative ambulation as we understand it in this country is not stressed. The discussion of the treatment of carcinoma of the prostate is rather pessimistic.

There is a successful effort throughout the volume to present in detail the essential, practical, and simple technics, both for diagnosis and treatment, available to the urologist. Thus the omission of a more detailed discussion of

the modern treatment of oliguria and anuria is surprising, but the essentials of urology are fully covered, and the author draws from his personal experience for apt illustrations which are most helpful.

—*Lt. Col. R. W. Satterthwaite, MC, U. S. A.*

Skull Fractures and Brain Injuries, by *Harry E. Mock*, M. D., Consulting Surgeon, St. Luke's Hospital, Chicago; Associate Professor Emeritus of Surgery, Northwestern University Medical School, Chicago. 806 pages; illustrated. The Williams & Wilkins Co., Baltimore, Md., publisher, 1950. Price $13.50.

"Theoretically, acute head injuries are within the domain of the neurosurgeon. The magnitude of the problem is such, however, that for practical reasons most such injuries cannot be treated by specialists in this field. They will probably remain just as they are at this time, the responsibility of general surgeons and even of general practitioners." This statement of an early neurosurgeon, quoted by the author, expresses the basic thought behind this comprehensive study encompassing over 50 years of treating head injuries. The book should be of inestimable value to the Navy surgeon, who may often be called on to manage these cases by himself during the critical period of illness. Controversial ideas and teachings over the years are analyzed in the light of results obtained, with the fundamental aim of reducing the mortality rate. Nearly 8,000 cases of proved skull fractures provide the basis for this study; the proved fracture furnishes a uniform measure with which to compile valid statistics and compare treatments.

The text is easily readable, well organized, and liberally sprinkled with case histories and illustrations. Many instances of mistakes in management, as well as successfully treated cases contribute to the establishment of sound, life-saving principles. Osseous and intracranial lesions and functional disturbances are extensively discussed. Diagnostic signs and symptoms are analyzed on the basis of over 2,500 case records. Of especial interest and value are the chapters on prognosis, general principles of treatment, medical management, operative treatment, and posttraumatic syndromes.

—*Lt. F. W. Meyer, Jr., MC, U. S. N.*

Psychosurgery in the Treatment of Mental Disorders and Intractable Pain, by *Walter Freeman*, M. D., Ph. D., F. A. C. P., Professor of Neurology, George Washington University, Washington, D. C., and *James W. Watts*, M. D., F. A. C. S., F. I. C. S., Professor of Neurological Surgery, George Washington University, Washington, D. C. 2d edition. 598 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1950. Price $10.50.

This book is one of the most valuable collections of cases of prefrontal lobotomy published to date. This operation is completely discussed from its indications to extensive follow-up studies. Nowhere else have 10- to 13-year follow-ups of lobotomized patients been published. Nevertheless, the book contains much controversial material and no student of psychosurgery will agree with all of the interpretations presented by the authors. The chapters on pain and on the pathology of the prefrontal lobotomy are most informative. The surgical technic of this operation is described. The surgical anatomy is discussed and roentgenograms showing the operative cut marked by lipidol are presented. The last 8 chapters are of special interest to the psychiatrist; and the material offered will be appreciated by physicians who want to know when psychosurgery will be of benefit to their patients. Throughout the book there are numerous illustrations, but the outstanding feature is the collection of descriptive, illuminating, and complete case histories. Transorbital lobotomy, a procedure which does not appeal to the neurosurgeon

and is contradictory to every surgical fundamental known to this reviewer, is discussed. Other technics of psychosurgery such as gyrectomy, topectomy, cortical undercutting, and thalamotomy are briefly mentioned. The value of this book lies in its collection and documentation of pioneer work which can serve as a working basis for continued study of the lobotomized patient. It offers certain theories and interpretations which, even though they may not be acceptable to all, will be a stimulus to the student.

—*Lt. Comdr. G. Clark, MC, U. S. N.*

The 1950 Year Book of Urology (October 1949–October 1950), edited by *William Wallace Scott,* M. D., Ph. D., Director, *James Buchanan,* Brady Urological Institute, The Johns Hopkins Hospital; Urologist-in-Charge, The Johns Hopkins Hospital; Professor of Urology, The Johns Hopkins University School of Medicine. 416 pages; illustrated. The Year Book Publishers, Inc., Chicago, Ill., publishers, 1950.

This book should be in every urologist's library. The introduction covering the decade 1940 to 1950 impresses one with the advances in diagnostic technic and therapeutic procedure, many of which we accept and use without thought as to the process of development. The survey of the literature for the year is comprehensive, world-wide in its scope, and would be extremely difficult for the average physician to acquire through his own reading. The arrangement of the book is excellent, permitting easy use for reference purposes. The material, although abbreviated, is exceedingly well presented.

—*Col. C. C. Dodson, MC, U. S. A.*

Atlas of Histologic Diagnosis in Surgical Pathology, by *Karl T. Neubuerger,* M. D., Professor of Pathology, University of Colorado School of Medicine, Denver, Colo., with a section on Exfoliative Cytology by *Walter T. Wikle,* B. S., M. S., M. D., Assistant Professor of Pathology, University of Colorado School of Medicine, Denver, Colo. Photography by *Glenn E. Mills,* B. A., M. A., Department of Visual Education, University of Colorado School of Medicine, Denver, Colo. 460 pages; illustrated. The Williams & Wilkins Co., Baltimore Md., publisher, 1951. Price $11.

In this atlas the author endeavors to meet the needs of residents, senior medical students, and physicians who are preparing for specialty boards. The book consists essentially of 880 black and white photomicrographs, each with the diagnosis in large type and accompanied by a brief description of the microscopic features and pertinent clinical and gross pathologic findings. Frequently areas from low-power fields are shown in higher magnification for greater detail. The presentation is by systems, beginning with the skin and subcutaneous tissues and ending with the eye and ear. A section on exfoliative cytology is included. The bone marrow has been purposely excluded as belonging more to the clinical pathologist rather than to the tissue pathologist. The better known standard texts consulted are listed alphabetically in the preface. The histologic material depicted was largely derived from the surgical accessions of the Colorado General Hospital as well as from the author's own extensive slide file collected over 25 years.

No single atlas of this kind could be expected to depict all pathologic entities, and this one is no exception. There are definite gaps, and as missing entities are not mentioned because of lack of textual material, they could be entirely ignored by the student who rested heavily on this text for review study material. In general, the illustrations are good and depict the lesions described. Some of the lower magnifications, however, lack sufficient detail to be of value. The accompanying legends in many cases could well have given more detail pertinent to the illustrations as there is adequate space on

almost every page for it. In many cases the meager description gives the reader little intimation of the nature of the lesion. In pathology, illustrations, however good, depend on adequate descriptive legends to be of maximal value, especially for those who do not specialize in the field concerned. Some of the diagnostic titles given are not in general use and could be considered controversial.

Whether the medical student or physician who studies pathology sporadically could gain much from this atlas is problematical, and for the trained pathologist it seems too superficial.—*Capt. W. M. Silliphant, MC, U. S. N.*

Anopheles and Malaria in the Near East, Anopheline Surveys in Syria and Lebanon, by *H. S. Leeson,* F. R. E. S., Major, R. A. M. C.; Anophelism and Malaria in Transjordan and in the neighbouring parts of Palestine and Syria, by *W. H. R. Lumsden,* B. SC., M. B., CH. B., D. T. M. and H., Lt. Col., R. A. M. C., and *J. Yofe,* M. D., D. T. M., Lt. Col., R. A. M. C.; The Anopheline Mosquitoes of Iraq and North Persia, by *T. T. Macan,* M. A., Ph. D., F. R. E. S., Major, R. A. M. C.; Introduction by Professor *P. A. Buston,* C. M. G., F. R. S. 223 pages; illustrated. H. K. Lewis & Co., Ltd., London, publishers, 1950. Price 35s. net.

Much valuable information concerning Anopheles and malaria is presented in this book. Its three sections were written separately and thus differ somewhat in form and content. Each contains an excellent account of the geography, climatology and distribution of anopheles for the particular area involved. The ecology of various anopheles, both vectors and nonvectors, is outlined. The important vectors of malaria in each region are designated. Corroborative data includes mosquito dissection, relative abundance and spleen indexes. The third section contains valuable observations on the dissection of female mosquitoes to determine their hibernation or nonhibernation tendencies and approximate time of egg laying. This book contains much essential information which is not available in any other single source. The illustrations, on the whole, are excellent and many vividly depict the great variety of habitats favored by the various vector species. It is regretted that keys to the anopheles of each region are not included, but it is understandable that the preparation of such information during the war was impossible. Malaria control in the highly important Near East will be much easier to achieve because of these significant contributions.—*Maj. Robert Traub, MSC, U. S. A.*

Hospital Staff and Office Manual, by *T. M. Larkowski,* M. D., F. A. C. S., Professor of Clinical Surgery, Stritch School of Medicine, Loyola University, Chicago, Ill.; and *A. R. Rosanova,* R. Ph., M. D., Clinical Instructor, University of Illinois Medical School, Chicago, Ill. 428 pages; illustrated. Romaine Pierson Publishers, Inc., Great Neck, N. Y., publishers, 1951. Price $5.

This handbook contains practical information on a variety of medical subjects, including routine hospital technics, laboratory procedures, electrocardiography, roentgenographic technic, anesthesia, materia medica, medicolegal practice, physical medicine, medicine, surgery, neurology, psychology, obstetrics, pediatrics, orthopedics, dermatology, ophthalmology, otolaryngology, psychiatry, and sulfonamide and antibiotic therapy. The information is concise and accurate and the book is well illustrated. It would be useful for interns and as a ready reference for any physician or surgeon. It could be used as a review manual for state board examinations. The index is adequate and the material is well presented. A handbook attempting to cover such a vast field of knowledge cannot give detailed discussions, hence the statements are dogmatic, but the book does fulfill its mission as a ready reference.

—*Commander T. D. Cuttle, MC, U. S. N.*

Clinical Parasitology, by *Charles Franklin Craig*, M. D., M. A. (Hon.), Sc. D., (Hon.), F. A. C. S., F. A. C. P., D. S. M., Late Colonel, United States Army, formerly Director, Army Medical School, and Assistant Commandant, Army Medical Center, Washington, D. C.; Emeritus Professor of Tropical Medicine in the Tulane University of Louisiana, New Orleans, La., and *Ernest Carroll Faust*, M. A., Ph. D., The William Vincent Professor of Tropical Diseases and Hygiene and Head, Division of Parasitology, Department of Tropical Medicine and Public Health, The Tulane University of Louisiana, New Orleans, La.; Consultant to the Surgeon General, U. S. Army; Consultant, U. S. Public Health Service, with a chapter on "Control of Medically Important Arthropods" by *Albert Miller*, B. S., M. S., Ph. D., Associate Professor of Parasitology (Medical Entomology) in the Department of Tropical Medicine and Public Health, The Tulane University of Louisiana, New Orleans, La. 5th edition. 1032 pages; illustrated with 326 engravings and 6 colored plates. Lea & Febiger, Philadelphia, Pa., publishers, 1951. Price $12.

This well-known text on medical parasitology has been expanded and brought up to date, incorporating much new data resulting from the intensive research conducted in this field during World War II. The new drugs useful in the treatment of parasitic infections including chloramphenicol for the prophylaxis and treatment of scrub typhus are discussed and the recent advances in malariology have been excellently treated. Of special interest to field workers will be the excellent new chapter on the control of medically important arthropods. In addition to presenting the basic philosophy of the various types of control, the chapter contains valuable information on specific insecticides, including uses, rates of application, and precautions. This book will continue to be an invaluable source of basic information on the diagnosis, treatment, and control of human parasitic diseases.—*Lt. Col. F. W. Whittemore, Jr., MSC, U. S. A.*

Practical Microscopy, by *L. C. Martin*, D. Sc., A. R. C. S., D. I. C., Professor in the Technical Optics Department of the Imperial College of Science and Technology, and *B. K. Johnson*, D. I. C., Lecturer in the Technical Optics Department of the Imperial College of Science and Technology. 2d edition. 124 pages; illustrated. Chemical Publishing Co., Inc., Brooklyn, N. Y., publishers, 1951. Price $2.50.

The authors present the practical principles of modern microscopy from the simple hand magnifier through the various microscopes. Whether the reader is interested in only the simple dissecting microscope or the more complex optical systems of the compound microscopes, he will find not only an evaluation of the physical limitations of each instrument, but also valuable notes on the means of standardization and the avoidance of pitfalls. This is accomplished concisely by the means of simple mathematical formulas and profuse illustrations. Among others, chapters are presented on dark-ground and phase contrast illumination, photomicrography, the metallurgic microscope, the use of polarized light, ultraviolet microscopy, and the electron microscope. A selected bibliography is also given.—*Maj. A. Leibovitz, MSC, U. S. A.*

Dimensional Analysis for Students of Medicine, by *Harold A. Abramson*, M. D., Assistant Clinical Professor of Physiology, Columbia University; Associate Physician and Chief Allergy Clinic, The Mt. Sinai Hospital, New York City; Consultant (Psychology), Department of the Army. 41 pages. The Josiah Macy, Jr. Foundation, New York, N. Y., publishers, 1950. Price $1.

The author has clearly and concisely illustrated the precise meaning and significance of a number of typical formulations commonly encountered in biology, biochemistry, and medicine, in terms of the fundamental physical units. The examples, including such items as: the work done by the heart, chemical reaction velocities, ultrafiltration, and electron wave lengths (as

applied to the electron microscope), re-emphasize that measurements of natural phenomena are based on the fundamental units and that relationships derived therefrom must be consistent in their physical dimensions. This was the first lesson taught in elementary physics and probably most quickly forgotten and most commonly ignored by advanced students in biology and medicine. This book is highly recommended to workers in biologic sciences and medicine because its simple lesson in logic is fundamental and because only an elementary knowledge of algebra and physics is necessary for a clear understanding of it.

In the foreword and preface the author has expressed the hope that assiduous application of dimensional analysis may effect a rapprochement between such scientific specialties as psychology and psychiatry and the purely physical group; that this in turn will so affect our educational systems and culture that world peace might ensue. Although this is a laudable objective, the reasoning displayed here is not so logical as that exhibited in the following chapters.—*Lt. Col. M. E. Freeman, MSC, U. S. A.*

Heart Disease, Its Diagnosis and Treatment, by *Emanuel Goldberger*, B. S., M. D., Associate Attending Physician, Montefiore Hospital, New York; Cardiologist and Attending Physician, Lincoln Hospital, New York; Consulting Cardiologist, St. Joseph's Hospital, Yonkers; Diplomate of the American Board of Internal Medicine; Lecturer in Medicine, Columbia University. 651 pages; 90 illustrations. Lea & Febiger, Philadelphia, pa., publisher, 1951. Price $10.

While intended primarily as a clinical monograph on diseases of the heart for the general practitioner, this complete text also provides the cardiologist, internist, and medical student with an abudance of well-organized up-to-date information on the subject. On reading this text one soon realizes that it is not "just another book on the heart" but that it is different in many respects from the usual monographs published on this subject. The omission of the many ancient dictums about heart disease which have been passed on from one text to another through several centuries and often found to be false; minimal reference to named signs, symptoms, syndromes, and diseases; the replacement of round table discussions on debatable subjects by a clear statement of the author's opinion or experience; and the avoidance of unnecessary repetition by careful cross references throughout add to the value of the book. The author's description of the diagnostic findings and their evaluation in the diagnosis of aortic stenosis is an example of his fearlessness in discarding the accepted but ancient teaching that a patient must have "a palpable systolic thrill at the base of the heart, an absent second heart sound at the aortic area, a low pulse pressure and plateau peripheral pulse along with a harsh systolic basal murmur" before the diagnosis of aortic stenosis can be made. Many current ideas in respect to the cause, diagnosis, and treatment of heart disease, which in the past have not appeared in a text but were found only in current scientific journals or taught in progressive clinics, are included.

Although the author, like Levine and others, stresses simple bedside procedures in diagnosis, he has also included the valuable information that can be obtained from such ancillary methods of examination as cardiac catheterization, angiocardiography, the use of the ballistocardiogram, and the electrokymogram. In spite of the fact that his previous publications have been chiefly on the subject of electrocardiography, he has been most conservative in emphasizing the value of the electrocardiogram in cardiac diagnosis. The arrangement of the text is excellent, each chapter being followed by a bibliograpny that includes for the most part only references from the literature of the past 10 years. It is not overillustrated. The information given is presented briefly but clearly.—*Col. T. W. Mattingly, MC, U. S. A.*

○